ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

What in the World!

Subjectively regarding the problems, unpleasantnesses and burdens of taxation, individuals and businesses see enterprise and property arrayed on one side against the forces of government and collections to support it on the other. Unfortunately, the matter is not quite so simple. Paradoxically, it is really far simpler. There is but the single dominant element of "how may society govern itself and who will pay?" If one group is taxed at any one time in an inordinately discriminatory manner it is because the majority, or those purporting to represent the majority, wish it so.

●

Utilities are the target of all targets for more and heavier taxes for the single reason that those with taxing power see them as best able to assume such a burden or most deserving of the levy. Informed voters, informed government and honest analysis of the facts by both are needed.

●

Philip Cabot, one-time utility executive, now a widely recognized authority on economics and business, discerns the menace of never-again-to-be-escaped governmental intrusion in the course of the New Deal. Necessary it may be, he told the Pennsylvania Electric Association; but temporary it must be, was his warning. Meanwhile, the band plays on.

●

Ticklish business, this matter of lower cost service to the home. Last week the International Association of Electrical Inspectors heard warm pleas against bare neutral and the newer type service cables. In this issue there is a description of the most recent development. Eventually, of course, it will all be smoothed out on a merit basis. Time is a great, if unhurried, exposer of fallacies.

●

There were those who felt that the NRA school of salvation intended to overlook the problem of the capital goods manufacturer—and employer—but the light is beginning to dawn and the big motors of heavy industry may soon be speeded up to keep pace with the rest of the parade. The worst hit some time receive the least attention.

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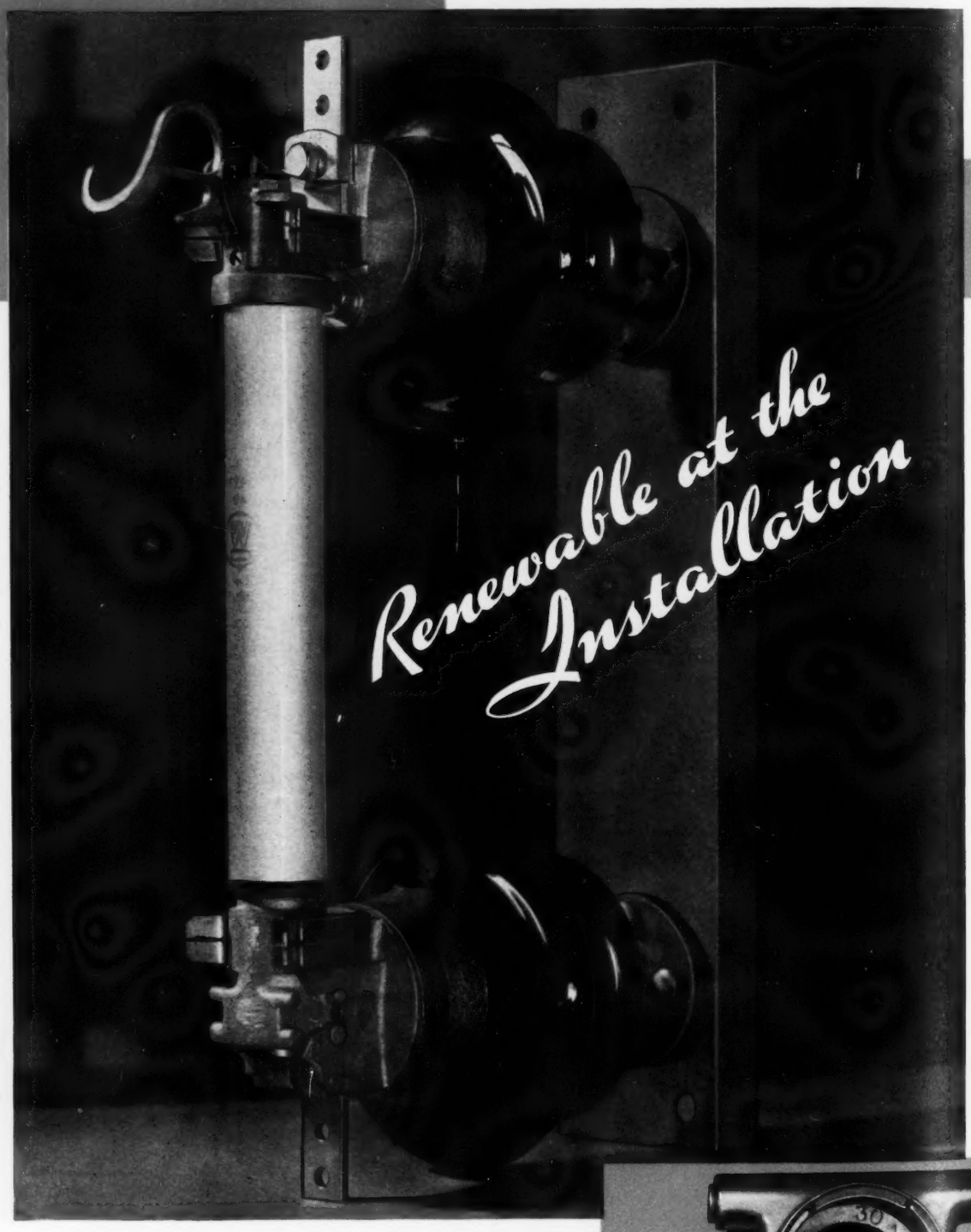
NRA MEMBER U.S. WE DO OUR PART

IT HAS THE



A 15,000-volt BA "De-ion" Fuse in closed position.

Right—*Open end of a "De-ion" Power Fuse, through which short-circuit pressures are freely vented. The drop-out disc, which indicates a blown fuse, has been removed.*

ELECTRICAL WORLD

Established 1883—McGraw-Hill Publishing Company, Inc.

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September 30, 1933

L. W. W. MORROW, *Editor*

Selling the Rehabilitation Market

THE problem of business expansion for the electrical industry involves the perfection, or at least improvement, of existing facilities on utility properties and in industrial plants. Replacement must take the place of additions. Analysis-selling in the interest of the client must replace competition for bids or order taking. The era of expansion is changed to an era of intensification, of rehabilitation and of replacement of the superficially satisfactory.

This market differs markedly from the past markets. To sell it is necessary to make a complete engineering and economic investigation of existing installations and then capitalize upon these data to show the prospective purchaser that he can save money, perhaps by spending little money, through a new layout, a changed assembly or the use of new methods. A factory must be surveyed as to complete physical and economic data before there is a prospect of selling a single item of new equipment. A utility assembly of apparatus must have an equally detailed analysis before data are available that may permit sales to be made. Thus, it is evident that sales expenses for this kind of selling are very high and sales competency requirements are far in advance of previous standards. The salesman must be able to show conclusively that he knows more about a particular business than those in charge and he must be able to capitalize upon balance sheet figures to get the customer to make capital investment expenditures.

Under these conditions it is necessary for the industry to weigh the new market conditions and to plan a changed organization for selling. A single-product manufacturer, for example, cannot sell this market except at prohibitive cost. Industrial executives and utility executives cannot be educated to do the work required of their own volition quickly enough to open up the market rapidly. There must be a plan; there must be co-operation.

Utility power salesmen can be drawn upon as aids. They can give true consulting service to industrial customers. This may help meet private plant competition by making savings in demand and energy charges. It may make possible serving more load from existing facilities. Above all, it will generate good will and confidence. These power salesmen should be used. Then, again, consulting engineering firms must develop this business if they expect to replace the construction business that enabled them to exist in the past. They must devise a plan and a method that will make rehabilitation work profitable to them. Possibly the manufacturers and the industrials may share the costs involved when the consulting firms devise an equitable plan.

But the single-product manufacturer has an even more direct incentive for action. This market is the only large market available in the current years. The competition of the multiple-product manufacturer will be almost overwhelming in this class of selling unless met upon some commercial basis of equality. It may be possible for manufacturers of single products to join hands to get the equivalent of multiple-product selling. It may be possible for joint action to support and sustain a subsidiary organization to make the necessary investigations. At all events, no busi-

ness executive can fail to look at this market without being concerned in the changed conditions and definite handicaps encountered.

All this but adds to the conclusion that the electrical industry must sell a replacement market. This requires a changed method and widely different specifications for competent salesmen. It means co-operation and joint action. It means teamwork to utilize the available approaches. These are (1) an awakening of the buyers to the fact that low-cost production may be had through rehabilitation; (2) the use of power salesmen and consulting engineers to get these data necessary as a preliminary to selling; (3) the use of co-operative action by single-product manufacturers in order to reduce the sales cost per unit of product sold, and (4) the compilation and promulgation of data by the engineers in utility and industrial plants so that executives may know the facts and thus be induced to take action that brings economic purchases.

This is a day of dollar engineering, of analysis selling, of marginal improvements. To get business the electrical industry must face the new conditions honestly and revamp its methods and its personnel to take advantage of all possible assets. More business means better business in terms of service to clients. How well the industry measures up to these changed conditions will determine its balance-sheet returns at the end of the next three years.

Select local executives and give them power

A logical step to stem the tide of socialization of electric utilities and of subsidized governmental competition with private utility enterprises is to give full authority to local utility executives to be responsive to local conditions. Local autonomy is an antidote to the hostile sentiment against holding companies. Apparently it is an unforgivable sin for local utilities to be profitable for distant investors or for local managements to refer executive decisions to distant headquarters.

During the expansion era of utilities the holding companies accomplished great good in the public interest and necessarily took unto themselves executive direction of local utility enterprises. This brought about economies, standardization, common policies and better service at lower rates. But this expansion and coagulation period has been superseded and, in addition, public sentiment has crystallized into enmity against holding companies.

Electric utilities are inherently local and property managers should be untrammeled and free to solve the problems they encounter in their local communities. These problems today are concerned with the public and require an entirely different type of executive from that used in the past. There must be a changed executive personnel, for the chief executive function now is to understand and get along with the public and the executive must like this work and be acceptable in personality to be successful. The light and power situation is comparable to the telephone situation of a few years ago. And it is not chance that finds telephone local managers expert in public relations and similar in their adaptable and presentable personalities. They are the result of a policy that involved selectivity. Light and power utilities must follow the same trail.

Investment domination must retire from the direction of operating policies. Accountant, engineering or legal types of executives must either become public relations types or give way to newcomers more fit to direct operations. Holding company management must restrict itself to consultation and aid on general policies and finance and help staff operating properties with the needed type of executives and then give them power to act. In the final analysis, the light and power industry will have national favor only when it builds up favor in each service area. Power to get and retain satisfied customers is a local power. Power to build business by building communities is a local power. Power to be a popular citizen and a leader in community affairs is a local power. Material prosperity and favorable public sentiment reduce to an aggregation of local executives who have the personality and the ability to measure up to the new conditions confronting the light and power industry. The veneer of the national power trust and the holding company must be removed as a topic for condemnation used unjustly but freely by politicians who capitalize upon public sentiment. Drain the flood of hostile sentiment by damming its sources.

THE WEEK

Electrical Manufacturers Agree on Code-Instituting Action

Product classifications reduced to seventeen characteristic groups.

Labor resolution passed to back employer-employee rights.

Supplemental codes provided for.

MORE THAN 600 electrical manufacturers met in Cleveland this week under N.E.M.A. auspices to consider the major program of putting the NRA code into operation. Much progress was made. Another item of importance dealt with a resolution about labor matters and still other work involved making of budgets, section meetings and the development of supplemental codes.

"What has been done under NRA is only a preliminary stage of what must be anticipated in the future," said President J. S. Tritle in his opening address. In his opinion the emergency legislation, perhaps with some modifications, will become a permanent national policy. Industry may expect in the future that the government will take more interest in its operations and will have supervisory jurisdiction over industry.

As a reflection of disturbed labor conditions Mr. Tritle said: "If the tenets laid down by some labor leaders are to be carried out in their entirety they will retard rather than speed prosperity." In his opinion the best present solution to labor troubles is in the wise direction of President Roosevelt.

Labor resolution passed

After a great deal of discussion a labor resolution presented by the board of governors was passed by the meeting on Tuesday night. This resolution pointed out that the electrical manufacturers were operating under a code approved by the President and that this code provides the labor provisions under which the industry is to operate. These provisions do not make it necessary by law for either employers or employees to agree to any particular form of contract. Yet the industry is subjected to these demands. After pointing out these conditions the resolution said that N.E.M.A. would continue to comply with the code provisions, but would resist any attempt on the part of any one to interfere with the rights of employers or employees under the code and will protect their interests in every practicable and legal way.

It is apparent to me that the National Industrial Recovery Act, with perhaps some modifications, will gradually pass from the status of emergency legislation to a permanent policy. Industry may expect in the future that government will take more interest in its operations with a view to stabilizing permanently our whole economic state. The more effectively our own or any other industry regulates itself so as to contribute to the stability of our national life, the less interference it will have from government. I believe we may expect from now on that government will have supervisory jurisdiction over all industry.

J. S. TRITLE,
President
National Electrical Manufacturers Association

Mr. Tritle, also vice-president and general manager of Westinghouse Electric & Manufacturing Company, so addressed the Cleveland meeting of N.E.M.A. this week. He warned of labor domination, stating: "I am of the opinion that if the tenets as laid down by some of the labor leaders are to be carried out in their entirety, they will retard rather than speed up prosperity."

Products groupings made

A final allocation of products to seventeen classes was made. Each of these classifications will be operated by a separate supervisory agency to be appointed by the board of governors at once. These agencies are preferably single individuals, but plural agencies have a maximum of three. These supervisory agencies will be the authority to carry out the code provisions. The seventeen product classifications with their subdivisions are as follows: (1) Installation devices including wiring devices with subdivisions of attachment plugs, lamp receptacles and sockets, snap switches, fuses, also knife and inclosed switches, small air circuit breakers, panelboard and distribution board signaling apparatus; (2) appliances including domestic and commercial cooking, heating and motor-driven appliances and fan motors; (3) refrigeration; (4) radio including radio receiving tube section; (5) X-ray and electro-medical apparatus including sun lamp section, vapor lamp section, X-ray and electro-medical group; (6) industrial apparatus including electric welding and welding wire, industrial control, motor and generator and industrial heating; (7) construction material including electrical porcelain and all mica, paper fiber and phenolic products; (8) electric transportation section with seven subdivisions; (9) generation including prime mover section, small turbine group, Diesel engine generator group and gas-electric set group; (10) transmission and distribution apparatus including electric meters and measuring instruments, high-voltage insulators, switchgear, including six subdivisions, transformers including capacitors, job line hardware and underground fiber conduit; (11) illumination with six major subdivisions; (12) roughing-in material with five subdivisions; (13) wire and cable with fifteen subdivisions; (14) dry batteries and flashlights; (15) specialties including electronic tubes, battery charging and ignition and test equipment, specialty transformers and small fixed condensers; (16) electric tools; (17) telephone manufacturers.

Code supplement considered

General recommendations were made for a supplement to the basic code and these will be considered by the members. These include trade practice provisions covering misleading advertising, false statements with regard to the policies of competitors, inducing breach of contract, fraud and misrepresentation as to quality or size, patent and trade mark infringements, secret rebates, selling without profit to induce sales, disparaging statements regarding competitors, splitting commissions with pur-

chasers and extending time of guarantees or warrantees.

In addition provisions were suggested for the product classifications to consider in making their individual supplementary codes. These include resale price maintenance, the right of the supervisory agency to fix a fair price in the event a destructive price policy is practised by an individual competitor, specifications as to time and quantities used in contracts, price discrimination by use of split shipments and observance of N.E.M.A. standards. In addition, some slight changes in the basic code were suggested and a statement of policy with regard to reciprocity is being formulated.

Needless to say, all this work and additional work to fix a procedure for nominating supervisory agencies and for preparing supplementary codes speaks well for the energy and effort devoted to get quick action at the meeting. It is expected that the supervisory agencies will be appointed at once and the code put into operation as rapidly as possible. The completion of staffs, arrangements for handling statistics and price lists, preparation of a budget amounting to $400,000 for next year were other important items of work. Progress is being made on cost-accounting work and it is believed that the entire undertaking can be put into operation shortly.

Behind the scenes there was a feeling of confidence in the leaders, many new applications for membership were in hand and a positive program was welcomed and acclaimed. The only disturbing cloud on the horizon was the development of labor troubles in some sections and a fear that these would grow unless prompt national action was taken.

J. S. Tritle was re-elected president of N.E.M.A. for the coming year.

▼

Tampa Electric Not to Rebuild

Tampa (Fla.) Electric Company does not need and will not rebuild its dam and power plant on the Hillsboro River recently wrecked by a flood, according to President Peter O. Knight. Instead, it is expected that the city of Tampa will acquire the property and rebuild the dam for the purpose of securing a water reservoir for the city in times of drought.

▼

Electrical Show Sells All Space

All space available for exhibits at the electric and radio show to be held next week under the auspices of the Electrical Association of Philadelphia has been sold according to a statement made by Horace P. Liversidge, president of the association. Such an advance sell-out has never been known in the six years the annual show has been given. Already $1,400 more has been paid for space at the show than the total received at the close of last year's show.

▼

T.V.A. Would Keep Apart Relief and Power Outlays

In response to strenuous local agitation for the immediate construction of Dam No. 3 (Joe Wheeler) above Muscle Shoals Chairman Arthur E. Morgan of the Tennessee Valley Authority has advised Secretary of the Interior Ickes that:

"The Tennessee Valley Authority heartily approves the construction of Dam No. 3 above Muscle Shoals on the Tennessee River as an emergency employment relief measure, on condition that it is built with public works money and not with Tennessee Valley Authority money, and that the carrying charges and construction cost shall not be charged to the Tennessee Valley Authority until the demand for power justifies the construction for that purpose.

"The dam is an integral part of the navigation program for the Tennessee River and will be a part of the power development program when it is needed. The only disadvantage to building the dam now is that it will not come into full use at once. This disadvantage may be overweighed by the great advantage of providing employment, by favorable construction prices and the fact that the construction of Dam No. 3 will be a substantial aid to navigation on the Tennessee River below Chattanooga. The navigation locks at Dam No. 3 are, in fact, now in process of construction by the Army engineers."

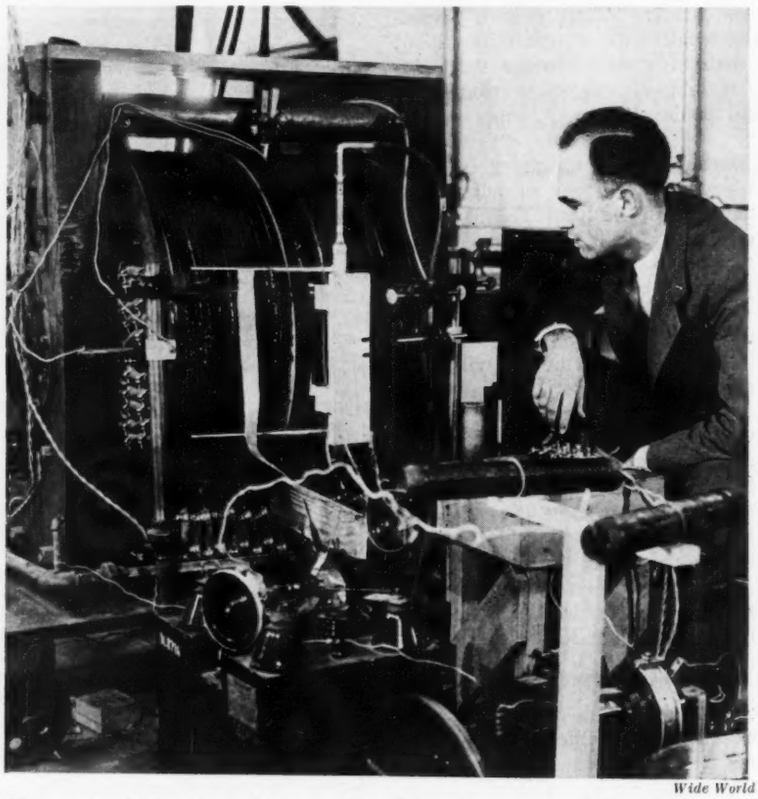
Double tower line planned

Aerial surveys for the Muscle Shoals-Norris Dam transmission line were completed last week. Such ground surveys as were needed to supplement the air work at some points also have been finished. It is expected that the final location may be selected for the entire line in the near future. It is likely that the erection of the line will be let in short sections to contractors, with the expectation that completion of the entire job may thus be speeded up.

Engineers of T.V.A. told Knoxville

▼

Science Observes Creation of Matter?



Wide World

From cloud-chamber photographs of cosmic ray particles traversing a lead diaphragm 11 mm. in thickness in a uniform magnetic field of 15,000 gauss Dr. Carl D. Anderson of the California Institute of Technology concludes that man has secured proof of the creation of matter from motion. With the apparatus shown he secured the evidence recently reported.

Tenn., officials late last week that plans are under way for the construction of a double transmission power line between Norris Dam in Tennessee and Wilson Dam at Muscle Shoals. One line would take an almost direct route between the two dams and the other would follow the course of the Tennessee River, making it possible to connect all the proposed dams on the river.

Llewellyn Evans, authority engineer, explained that two lines would insure against service interruptions in case either line was broken by a storm. Mr. Evans also told a Knoxville City Council committee that the authority would bring power into Knoxville whenever the city wants it. Evans explained the 7 mills per kilowatt-hour rate was purely an average rate and probably would be much lower for the city. That depends, he said, upon how the city consumes it. If it is used at a fairly steady, continuous rate it would be much cheaper. If there are excessive peaks the cost would approach the 7 mill figure.

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Pennsylvania Inquiry Ends After Three Years

After constituting a political, regulatory, personal and popular storm center for nearly three years the Pennsylvania Senate investigation of public utilities has been brought to a close. F. E. Edmonds, chief counsel, has returned to individuals and corporations the huge stacks of exhibits deposited with the committee.

Injunction suits halted the McClure committee's hearings last year and, after several informal sessions this year, the investigation was killed when Governor Pinchot vetoed a Senate resolution which would have continued it. Created to inquire into Pinchot charges that the Public Service Commission was the "catspaw" of utility companies, the investigation was pursued by several groups amid the turbulence of recurring charges and counter charges by Pinchot and Senate leaders.

The principal result was the McClure act, passed by the 1933 Legislature and signed by Pinchot, strengthening the state public service company law and giving the commission greater control over utility rate increases, securities, holding companies and appliance sales.

In the midst of the dispute, which began as Pinchot started his second term as Governor in January, 1931, the Governor obtained control of the commission. Five of his appointees are now members. None has been confirmed by the Senate, which is expected to act on them at the special session in November.

At the climax of his fight for control of the commission the Governor obtained a Supreme Court ruling ousting his former friend and right hand man, Dr. Clyde L. King, from the chairmanship to which Pinchot had named him. In other high spots of the drive, the Governor forced the resignation of the late Chairman W. D. B. Ainey and Commissioner Emerson L. Collins. Edmonds, who directed the dispersal of the investigation committee's documents, succeeded Oliver K. Eaton.

Devaluation Without Inflation

Resumption of the inflation-yes, inflation-no merry-go-round this week left markets more demoralized than before. Apparently from the opinion that promised results may be obtained without currency inflation, credit inflation is hopefully offered as an unlikely-to-be-seriously-opposed substitute. Plans announced whereby original producers of cotton may borrow 10 cents a pound, though cotton is now selling for less than that, establish a minimum price. Federal expenditure of up to $75,000,000 for farm products to feed the needy assured. Secretary Ickes announces that the $3,300,000,000 allocated for public works may be exhausted by January 1. Federal Reserve purchases of government bonds continue at high rate. Plan to permit opening of virtually all closed banks with government backing of residual, doubtful assets apparently impends. Steel industry assured of government loans to railroads for rail purchases if traditional $40 a ton price, in spite of higher NRA costs, is broken. Plenty of credit inflation, with the addition of more debts as a cure for amounts already overburdensome, spells inevitable currency inflation to many observers.

Figures of the week show quickly-fluctuating commodity prices at or near a high for the whole period. Security prices weak. Volume indexes in some cases involve conflict with holiday week preceding latest figures. Carloadings up 14.1 per cent to about normal expectancy. Bituminous coal output falls as completion of fear-buying restores storage reserves of users. Energy production, closely following 1931 levels since July, drops off appreciably from then. September automobile production for the first time since May will be less than 200,000 a month, according to estimates. Lumber production up in post-holiday normalcy. Steel output fails to show gains. General business indexes back to May levels.

Plans for Insull's "Big Three"

Pointing to lower revenues and increased operating expenses, James Simpson, chairman of Peoples Gas Light & Coke, one of Samuel Insull's Chicago "Big Three" utilities, announced to stockholders this week that the dividend on the common stock had been passed. Reports from Chicago indicate that the two other properties of the group, Commonwealth Edison and Public Service of Northern Illinois, may be unified through an exchange of stock at an early date. The latter would probably be absorbed by the former. Such a plan is said to have been suggested by Mr. Insull some years ago.

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Recourse to Federal Courts

C. W. King, attorney for the Oklahoma Tax Commission, seeks a law which would permit the state, through its various boards and commissions, such as the Tax Commission, to enter into the federal courts as a plaintiff. He states that such a right would facilitate tax collection cases against utility companies, oil companies and other major taxpayers, since the federal courts operate without such local atmosphere or influences as are sometimes found in the state courts.

1,500-Hp. Pumping Motors 97.9 per Cent Efficient

Records for high efficiencies in motors of comparable size are, it is said, to be set by the six 1,500-hp. Westinghouse synchronous motors driving centrifugal pumps at Chicago's new Harrison Street pumping station. It is also reported that they offer across-the-line starting with less than 400 per cent (full load) current inrush. Over-all efficiency of the motors and their exciters is reported at 97.9 per cent, an efficiency, according to Westinghouse engineers, comparable to motors rating 25,000 hp.

The conventional method of starting large high-speed motors for pump drive by use of a transformer or reactor to reduce the voltage on the motor until it has started has been discarded in favor of connecting the motor through circuit breakers directly to full line voltage and limiting the starting current by refinements of motor design.

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Union Electric Drops Two Suits

Two suits filed in the St. Louis Circuit Court in 1932 by the Union Electric Light & Power Company of St. Louis in an effort to win for Louis H. Egan, president of the company, a place on the board of directors of the Laclede Power & Light Company have just been dropped. While no reason was given in the court memorandum for the dismissal of the suits it is understood that a recent decision of the Missouri Supreme Court sustaining the state commission stand in rejecting an application of the Union Electric for permission to acquire and hold voting trust certificates in the Laclede Power & Light Company (ELECTRICAL WORLD, August 19, page 233) led to this action.

Coming Meetings

American Welding Society — Detroit, Mich., October 2-6. M. M. Kelly, 29 West 39th St., New York.

National Safety Congress. Public utilities section—Chicago, Ill., October 2-6. C. B. Boulet, Wisconsin Public Service Corporation, Milwaukee, Wis.

National Association of Railroad and Utilities Commissioners — Cincinnati, Ohio, October 10-13. James B. Walker, 270 Madison Ave., New York.

Association of Iron and Steel Electrical Engineers—Pittsburgh, Pa., October 17-19. John F. Kelly, Empire Building, Pittsburgh.

▼

Not Rates, but Taxes, of Major National Import

Drastic reduction in government expenses and taxes and an aggressive defense by the customers and security holders of the public utilities against rapidly mounting taxes was urged by Paul S. Clapp, vice-president Columbia Gas & Electric Corporation and one-time managing director of the late National Electric Light Association, at the American Gas Association's fifteenth annual convention this week.

The utility companies of the country, Mr. Clapp said, at the moment are between the upper millstone of increased taxes and higher prices for labor and material and the nether millstone of pressure for lower rates.

Faced with an advancing trend in materials used, already up on the average 15 or 20 per cent since January, and direct increases in labor costs with participation in the NRA, no one would care to predict where operating expenses, including taxes, will finally lead, Mr. Clapp said.

While the country appears to be definitely moving along the road to recovery, he said, the constantly increasing burden of taxation growing out of cost of government is one large obstacle in the path.

According to Mr. Clapp, the 1933 tax levies for the nation—that is federal, state and local—will approximate $10,500,000,000, the greatest in the history of the country. Total expenditures by all governmental agencies, this year, however, will exceed tax income by about $4,000,000,000 and total more than $14,500,000,000 Mr. Clapp estimated, the difference coming from borrowed money and other miscellaneous sources of government income.

At the end of 1932, Mr. Clapp said, taxes were 30 per cent greater than the peak of 1923, when they were 330 per cent higher than in 1913.

Investors' interest overlooked

In applying taxes on utilities, Mr. Clapp said, legislators seldom, if ever, think in terms of the large number of individual investors; he pointed to the large amounts of utility securities in the investment portfolios of savings banks and insurance companies supporting the integrity of insurance policies and savings accounts. They think of the utilities as owned by a few individuals, whereas there are between 2,000,000 and 3,000,000 investors in the gas and electric utilities alone, he said, and the vast majority of them own stock in small amounts, dividend payments on which in many cases have become the principal remaining source of income.

The cost of government per family averages about $1.10 per day, while the average daily cost per family for gas and electricity is about 20 cents per day, Mr. Clapp related. "If legislators," Mr. Clapp said, "would focus more of their efforts toward reduction of government expenses, and less toward attacking utility rates, they would render a real and practical relief to their constituents."

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Oklahoma Sales Tax Brings Commission Rift

Neither unanimity of opinion by regulatory authority nor clear indication of what policy is to be pursued greets electric light and power enterprise in Oklahoma. Chairman Paul A. Walker of the State Corporation Commission, in a dissenting opinion from the order of the two other commissioners vacating an order directing utilities to absorb the 1 per cent general sales tax (ELECTRICAL WORLD, September 16, page 359) has declared he believes the utilities to be right where they were before the second order was issued and that those intending to pass the tax on to consumers must ask for rate increases to permit its legal absorption.

Even if they can pass on the tax, Chairman Walker advises them to absorb it, alleging that they would lose more in customer-good will than they would save in dollars. It is estimated about $500,000 annually is involved in tax on sales of electric, natural gas and telephone services in the state of Oklahoma.

All utilities absorbed the tax (ELECTRICAL WORLD, August 26, page 265) as first imposed, though several gas companies then filed with the commission notice of appeal to the Supreme Court. After the commission vacated its first order nothing further was done about the appeal.

▼

Ohio Tax Deferred

Speedy adjournment of the Ohio Legislature prevented consideration in the Assembly of the Haynes bill, increasing the excise tax on telephone and gas companies, which passed the Senate earlier in the week. The bill originally provided for increasing the tax on electric companies, but these were eliminated because of the 3 per cent federal tax, which they are paying and which was not assessed against telephone and gas companies.

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Arizona Commission Halts Utility's Sales Tax Plans

Orders to discontinue collection of a sales tax from its customers and to refund taxes already collected have been issued to the Tucson Gas, Electric Light & Power Company by the Arizona Corporation Commission.

Under the privilege sales tax law, passed recently by the Arizona Legislature in special session, the utility maintained it could collect the ½ of 1 per cent state tax on electricity legally. The Corporation Commission took the stand that utility rates were fixed and could not be altered without permission of that body. More time was asked in which to study the law. Meanwhile, taxes being collected from the utility's electricity consumers were ordered impounded.

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Utility Code Hearing Asked by Workers' Group

Recovery Administrator Johnson has been petitioned in a letter from D. W. Tracy, president of the International Brotherhood of Electrical Workers, to set an early date for hearings on the electric light and power code (ELECTRICAL WORLD, August 12, page 193) because of alleged tension among the employees, stated by Mr. Tracy to feel that their grievances are not receiving consideration.

Violations of the re-employment agreement have been charged by officials of the union against electric light and power utilities in East Peoria, Ill.; San Francisco; Springfield, Mass.; Butte, Mont.; Shreveport, La.; Great Falls, Mont.; Houston, Texas; Portland, Ore., and San Diego, Cal.

Among the charges were the following: The Presidential agreement, as put into effect temporarily by the utilities, works to lower wages, instead of increasing purchasing power; the agreement has not served to increase employment, but has operated merely to further a share-the-work movement among the employees at the expense of the employees and regular employees are hired only on "emergency work," when there is no real emergency, but because the companies wish to refrain from hiring additional help.

Observers see but a bold stroke to emphasize the existence of a little-known organization with the prospect of endeavoring to make it a national force in the utilities. Electric light and power enterprise has never been a union operation.

Associated Again Sued on Recapitalization Plan

With the seeking of an injunction against the carrying out of the recapitalization plan for the Associated Gas & Electric system in a bill of complaint filed in Chancery Court (Delaware) by Tessie Berwick, owner of 30,000 in debentures of the Associated Gas & Electric Company of New York, the third attempt to prevent the company from rearranging its capital set-up has been made. In this latest attempt the New York corporation, the Associated Gas & Electric Corporation of Delaware, past and present directors of the two and the Associated Gas & Electric Securities Company, Inc., are named as defendants.

It is alleged in the bill that, regardless of the involved financial difficulties in which the New York corporation and the system find themselves and in disregard of the rights of the holders of the company's debentures, the corporation, the individual defendants and the securities company have proposed that the system be recapitalized.

To further the plan of recapitalization it is proposed that the Delaware company is to create new security issues. The bill alleges that this proposal is illegal and that previous transfer of certain assets of the New York corporation to the Delaware corporation was illegal.

The court is asked to appoint a receiver or trustee to take charge of the securities of the Delaware company, which the complainant holds belong to the New York corporation, or to obtain the transfer of them, and to enjoin the Delaware corporation from issuing bonds or debentures of any nature in connection with the recapitalization plan.

Last month Associated Gas & Electric Company was upheld in two court decisions, which denied injunctions against the carrying out of the plan of rearrangement (ELECTRICAL WORLD, August 12, page 197, and August 19, page 229).

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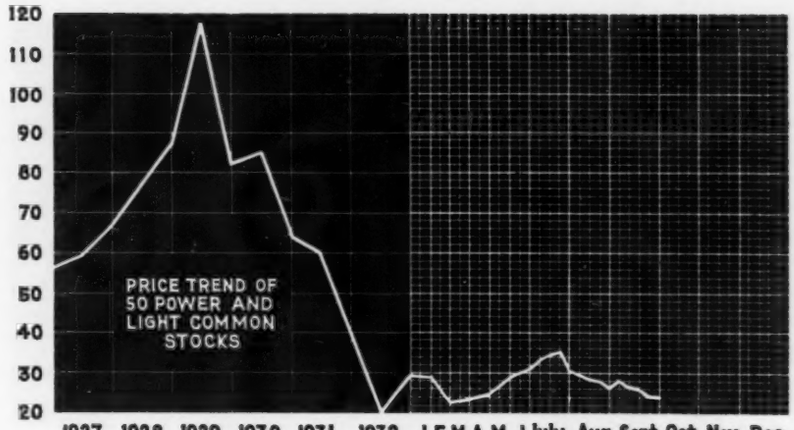
Canadian Gains Through Exchange

Decline in the premium differential on United States funds to around 2 per cent constitutes an important development for Canadian utilities with bond interest charges payable in U. S. dollars. The approximate exchange charge of 2 per cent at the time compares with an average of around 10 per cent earlier this year and of close to 15 per cent during the bulk of 1932. Shawinigan Water & Power Company, for example, with interest on $53,447,000 of 4½ per cent bonds falling due on October 1, finds the exchange charges on the total interest requirements of $2,406,150 to be only $48,123. With the exchange rate around 11 per cent on October 1 last year extra charge on the company's earnings was $265,000 while in 1931, with the exchange at about 20 per cent, it was approximately $481,230.

Decline in Utility Stocks Halts



Though gaining but fractionally, the "Electrical World" average of common stocks stood at 23.9 this week; 23.8 last. This is the second interruption to the decline which began in July.

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P. G. & E. Cuts Dividend

Common-stock dividends of the Pacific Gas & Electric Company, hitherto on a $2 annual basis, became 37½ cents a share quarterly when the directors voted the October 16 disbursement.

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Iowa Southern Extension

Holders of Iowa Southern Utilities Company (Maine) first mortgage 6 per cent bonds, including those with 2 per cent extra coupons attached, and of the Burlington Railway & Light Company first mortgage 5 per cent sinking fund bonds, extended at 8 per cent, all maturing on October 1 next, have been asked by the management of Iowa Southern Utilities Company (Delaware) to agree to an extension of the payment of the principal amounts until October 1, 1938, all at the annual interest rate of 8 per cent. The total amount is $2,857,800.

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Electric Public Service

Rival groups for reorganization in interest of the holders of Electric Public Service Company 6 per cent secured notes due April 1, 1941, and in default since February 1 of this year have appeared. A protective committee, headed by J. L. Kauffman, opposes the reorganization committee of W. W. Turner.

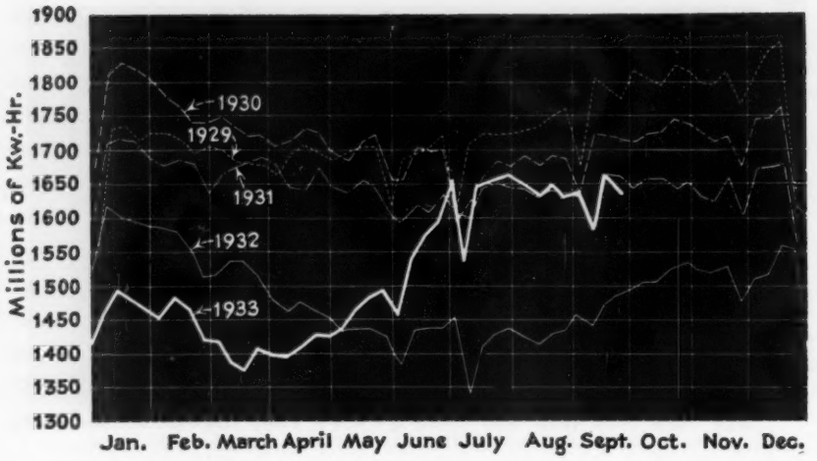
Insull Extradition Delayed; Bond Interest to Be Met

Refusal on the part of the Greek Ministry of Justice to accept the United States Legation's translation of necessary documents has delayed proceedings in the extradition case against Samuel Insull. The papers (ELECTRICAL WORLD, September 23, page 389) are now being translated by the Foreign Ministry.

Semi-annual interest of $431,252 due October 1 on United Public Utilities Company will be paid on the first lien 6 per cent and 5½ per cent bonds outstanding, Samuel W. White, receiver, announced last week. At the same time he declared revenues must show substantial betterment if further payments are to be made. Mr. White was authorized to pay the interest installment by Federal Judge Walter C. Lindley. Various representatives of the security holders interested in the reorganization of the company and its parent company, United Public Service Company, are working on the revision of the reorganization plan proposed several months ago. It is expected that the revised plan will be submitted to security holders in the near future.

It was pointed out that net earnings of the company during the first eight months of this year have been barely sufficient to cover the first lien bond interest requirements. Mr. White stated, however, that in view of the increase in expenses arising out of operation under the NRA code and the new federal tax on gross sales of electricity a substantial increase in revenues, sufficient to provide for these new additions to operating expenses, will be required if the company is to make further interests payments.

Weekly Output Declines



Some reduction in manufacturing activity, particularly in the Middle Atlantic and Central industrial areas, is indicated by the energy output of central stations for the week ended September 23 as announced by the Edison Electric Institute. Total production, given as 1,638,757,000 kw.-hr., was about 25,000,000 kw.-hr., or 1.5 per cent, less than in the preceding week, though still nearly 10 per cent higher than a year ago. For the first time since the middle of July it missed the 1931 figure by an appreciable amount.

In the West Central region, which is primarily agricultural, the margin over 1932 also diminished; in other sections previous gains were maintained, the Rocky Mountain region again leading in percentage.

Weekly Output, Millions of Kw.-Hr.

1933		1932		1931	
Sept. 23..	1,639	Sept. 24..	1,491	Sept. 26..	1,660
Sept. 16..	1,663	Sept. 17..	1,476	Sept. 19..	1,663
Sept. 9..	1,583	Sept. 10..	1,424	Sept. 12..	1,582
Sept. 2..	1,637	Sept. 3..	1,465	Sept. 5..	1,636
Aug. 26..	1,630	Aug. 27..	1,436	Aug. 29..	1,638

Per Cent Change from Previous Year

Region	Week ended Sept. 23	Sept. 16	Sept. 9
New England	+ 8.6	+ 9.5	+10.7
Middle Atlantic	+ 4.7	+ 9.3	+ 7.7
Central industrial	+13.5	+17.9	+16.2
West Central	+ 3.5	+ 6.9	+ 3.7
Southern States	+11.7	+10.7	+ 8.4
Rocky Mountain	+28.0	+27.6	+26.7
Pacific Coast	+ 1.3	+ 1.2	+ 2.6
United States	+ 9.9	+12.7	+11.1

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Grand Coulee Plans Bring Portland Acrimony

Bitterly disappointed with reported administration plans for a 30-ft. dam at Booneville on the Columbia River instead of a 72-ft. dam, costs $15,000,000 and $44,000,000 respectively, Mayor Joseph Carson of Portland, Ore., has urged the City Council to boycott power from Grand Coulee in the event that the 30-ft. plans go through.

Chairman Frank R. McNinch of the Federal Power Commission last week visited the Northwest, stopping to inspect the Cushman plant of the city of Tacoma, the Skagit development of the Seattle City Light Department and the site of the Grand Coulee dam.

"In the opinion of some," McNinch said in the course of his trip, "the power resources of the country are overdeveloped. During the depression the domestic use of power was increased while there was a great loss in industrial power. The domestic pick-up was not great enough to absorb the industrial loss. At present the industrial load is beginning to pick up. In my belief the power resources of the country are not overdeveloped."

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Electrical Exposition Encourages Promoters

So successful has the National Electrical Exposition in Madison Square Garden, New York, proved to be that the management has been asked by manufacturers and distributors to hold another show in September, 1934. A second show next year in the Middle West, preferably Chicago, following the New York exhibition by about two weeks, also is planned.

Attendance at the show has increased from day to day. Last Saturday the paid gate reached 28,565, and the total up to Saturday night was 68,009. The Sunday crowd was estimated at 20,000. This week showed similar figures.

Col. John R. Kilpatrick, president of Madison Square Garden, said he was so pleased with the apparent success of the affair that a new "show department" had been organized to promote subsequent expositions of this type. Similar shows in other industries will be promoted.

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Beauharnois Output to Be Greatly Increased

Power deliveries of the Beauharnois Power Company will be increased according to contracts from 60,000 to 133,000 hp. on October 1.

Of this additional energy the Ontario Hydro-Electric Power Commission is scheduled to take 40,000 hp. and Montreal Power Consolidated 25,000 hp. The balance of 8,000 hp. will be taken by Montreal Cottons. The company's contracts, which call for eventual delivery of 462,000 hp., comprise the following: Ontario Hydro-Electric Power Commission, 250,000 hp. at $15 per annum; Montreal Light, Heat & Power Consolidated, 200,000 hp. at 14.65 per horsepower, and Montreal Cottons, Ltd., 12,000 hp., of which 8,000 is gratis and the balance on option at $15 per horsepower per annum.

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Oklahoma Tax Assessments

Reductions averaging from 10 to 12 per cent on assessed valuations of public utility and service company properties for the present fiscal year have been ordered by the Oklahoma state Board of Equalization. Following a 20 per cent reduction last year, this makes a total reduction of a third within two years time. The reductions in general followed the percentage of real estate reductions in the various counties in which the properties, such as those of an electrical utility, are located.

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Victoria Falls Project

Though the Victoria Falls Power Company has secured a 60-year monopoly for hydro-electric development of the Victoria Falls in South Africa it is considered unlikely, because of the great distances between the Falls and the Rand, that power will be generated in this way for many years to come. The company now supplies the Rand gold mines through fuel-generated energy.

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Shawinigan to Expand

Completion of the Rapid Blanc plant of Shawinigan Water & Power Company has been authorized by the board of directors. Before May 1, 1934, its capacity will therefore be increased by at least 80,000 hp. to double the present capacity. No new financing will be necessary, it is stated.

Power Commission Hears California Utility Pleas

Hearings before Frank R. McNinch, chairman of the Federal Power Commission, in San Francisco on the claim of the Southern California Edison Company against the San Joaquin Light & Power Corporation for benefits it contends the San Joaquin corporation has derived from Edison headwater developments on the San Joaquin River have been adjourned until December 1. Briefs are to be submitted within 30 days and oral argument will be taken by the commission in Washington, D. C.

From testimony introduced at the hearings the Federal Power Commission will determine the costs of Edison company developments, interests, depreciation, the quantity of additional power actually generated by the San Joaquin company due to Edison storage and other factors. On these data will depend decision of what the San Joaquin company should pay for benefits derived during the past ten years and how much future annual payments shall be. Edison company claimed approximately $1,000,000 for past benefits and an annual toll of $122,000 for the future.

The case is the first of its kind brought under the terms of the federal water-power act and a precedent applicable in many other states may be set in the decision.

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Superheater Company Expands

Management of the Air Preheater Corporation, manufacturer of Ljungstrom preheaters, has been taken over by the Superheater Company. The former will retain its corporate identity under new management. Sales activities will be co-ordinated with the industrial department of the Superheater Company.

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East Bay Contract Renewed

Directors of the East Bay Municipal Utility District, Oakland, Calif., have voted to renew the present contract for sale of power from the 20,000-hp. Pardee plant to the Pacific Gas & Electric Company for an additional ten years. The contract, which was not to expire until 1935, was renewed on the grounds that conditions at that time might not result in as favorable a price for power as might be obtained now.

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Virginia Power Project

Urged by North Carolina cities seeking to develop water power for about a dozen communities, discussions have been had with the federal Public Works Board of Virginia over the possibilities of federal financing of a project near Smith Mountain, on the Staunton River in Virginia. Possibilities for power development there have been discussed for nearly seven years.

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Refrigerator Sales Rise for Month and Year

Unit sales of household electric refrigerators by members of the refrigeration division of National Electrical Manufacturers' Association during August were 82,495 units, compared with 23,124 in August, 1932, an increase of 256 per cent.

Unit sales for the year to date total 742,572 units, compared with 569,344 for the corresponding period of 1932, an increase of 30 per cent.

Cumulative dollar sales for the year to date, however, are only 4.86 per cent ahead of those for the corresponding period of 1932.

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Japanese Lamp Imports Meet Anti-Dumping Orders

Anti-dumping orders against incandescent electric lights from Japan have been ordered by acting Secretary of the Treasury Acheson upon the grounds that they were likely to injure the domestic industry and "likely to be sold in the United States at less than their fair value."

Imports of electric lamps for the seven months ended with July, 1933, amounted to 58,494,480 lamps and were valued at $388,470. In July, the last figures available, the monthly imports amounted to 7,505,379, valued at $43,508. This compares with 9,219,126 lamps, worth $103,118, imported in July, 1932, and 6,700,995 lamps, worth $156,615, in July, 1931. The total for the first seven months of 1932 is as follows: 56,125,924 lamps, valued at $704,175.

The dumping duties range from 3 or 4 cents to 50 cents per hundred on lamps, depending on the particular shipment. The duty prescribed in the tariff act of 1930 on incandescent electric lamps is 30 per cent ad valorem.

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Electric Manufacturers' Club

At a meeting this week the Electric Manufacturers Club elected the following officers: President, J. G. Harbord, chairman Radio Corporation of America; vice-president, A. W. Robertson, chairman of Westinghouse Electric & Manufacturing Company; secretary, Robert Edwards, president Edwards & Company; treasurer, W. L. Hinds, vice-president Crouse Hinds Company.

Major New Construction This Week

United States Engineer Headquarters, Washington, D. C., have received an appropriation of $1,520,000 for new lock and dam on Cape Fear River, near Wilmington, N. C., including power house, pumping station, electric-operated gates, etc.

Broad River Power Company, Columbia, S. C., plans transmission line to Eastover, S. C., and vicinity, about 19 miles, with distribution facilities.

F. & M. Schaefer Brewing Company, Brooklyn, N. Y., will build a $100,000 bottling plant.

Tipton, Ind., plans city-owned electric light and power plant. Fund of $150,000 being arranged.

Bureau of Yards and Docks, Navy Department, Washington, D. C., asks bids until November 8 for electric-operated pumping machinery and complete auxiliaries for extensions in oil distribution system, Pearl Harbor, T. H. Appropriation of $230,000 is available (Specifications 7136).

Heavy-duty motors, electric cranes, hoists, transformers, pumps, etc., will be purchased by Tampa (Fla.) Shipbuilding & Engineering Company. A $750,000 project. (Federal loan secured.)

Christian Moerlein Brewing Company, Cincinnati, Ohio, plans power plant at new brewery. Complete, a $4,000,000 project.

Jamestown, N. D., plans fund of $500,000 for city-owned electric light and power plant.

United States Coast Guard Headquarters, Washington, D. C., will seek bids for air bases at St. Petersburg, Fla.; Biloxi, Miss.; Galveston, Tex., and Port Angeles, Wash., including electrical facilities, power substations, etc. Appropriation of $290,000 authorized for each base.

Van Nostrand Brewing Company, Charlestown, Boston, Mass., plans $250,000 brewery.

New Safe Harbor Unit

Safe Harbor Water Power Corporation last week placed in operation a recently completed 42,500-hp. hydro generating unit in its Safe Harbor (Pa.) station on the Susquehanna River. This new generator is the fifth to be placed in service and brings the installed capacity at Safe Harbor to 212,500 hp. The plant, which began generating power in December, 1931, when two generators were placed in operation, is designed for an ultimate installation of twelve units.

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New York Metal Prices

	Sept. 19, 1933 Cents per Pound	Sept. 26, 1933 Cents per Pound
Copper, electrolytic	9.00	9.00
Lead, Am. S. & R. price	4.50	4.50
Antimony	6.75	7.00
Nickel ingot	35.00	35.00
Zinc, spot	5.12	5.12
Tin, Straits	48.00	47.25
Aluminum, 99 per cent	23.30	23.30

As to Rates——

• Philadelphia Electric Company's rate case continued in the Dauphin County Court last week with the Pennsylvania Public Service Commission challenging the right of the court to issue an injunction against the commission in a case in which no final order has been issued. John F. Weiss, chief counsel for the commission, raised the question after the court had granted a temporary order restraining the commission from proceeding unless the burden of proof is placed upon the complainants (ELECTRICAL WORLD, September 16, page 362). Mr. Weiss' objections are based on the contention that the court has no jurisdiction in commission proceedings until a case is finished and an order written. To hold otherwise, the commission argues, would permit protracted delay of commission cases. Judge W. M. Hargest set October 3 for argument.

• Carolina Power & Light Company of Raleigh, N. C., injecting the question of increased cost of operation under the national industrial recovery act and codes, has asked the South Carolina Commission to consider effects of the recovery program in the rate reduction case now pending against the company. An affidavit set forth that the NRA code and the 3 per cent federal tax on power would increase the company's operating costs allocable to South Carolina approximately $57,000 annually. Louis V. Sutton, head of the petitioning company, said the recovery code had resulted in employment of 60 additional persons by his company and a payroll increase of approximately $60,000 annually. Other requirements to be met by March 1 would put other men to work and bring an additional payroll increase of $50,000. Approximately $20,000 of this would be applicable to South Carolina service of the company.

• Railway Commissioner Bollen of Nebraska is taking steps to require electric power companies operating in the state to supply full information as to their operating revenues and expenses, together with schedules of rates and all other information. The commission has never been given authority by the Legislature to fix rates for light and power, but Commissioner Bollen says the constitutional grant of power to the commission is sufficient to give the commission supervision. No reports except as to disposition of funds received from the sale of securities approved by the commission have ever been required in the past. Commissioner Bollen says that the data will make more easily accessible company figures on valuation and earnings to communities interested in such information in rate, tax or franchise controversies.

• Plan of the New York City electric companies under the recovery code to hire 2,100 new employees at an average wage of $32 a week has resulted so far in the employment of 368 persons at an average wage of $19.81, Milo R. Maltbie, chairman of the Public Service Commission, stated at a hearing last week. After a detailed analysis of an exhibit showing the wages paid the new employees and the allocation to various departments, Mr. Maltbie said he wanted the actual average wage noted on the record of the rehearing on the commission's order for temporary emergency rate reductions. Cross-examined by Frank E. Carstarphen, Assistant Corporation Counsel, Robert B. Grove, vice-president of the New York Edison Company, said it was the policy of the companies to hire former employees, but he did not know how many of the 368 were in that category. He added that it was the policy of the companies to promote old employees and fill the vacancies with new employees. Mr. Maltbie discovered, through Dwight S. Sargent, assistant personnel director of the New York Edison Company, that the labor turnover in the companies was 40 per cent in 1929 and only 6 per cent in 1932.

Court delays New York rate case

Court test of the Public Service Commission's order to reduce electric and gas rates in New York City and Westchester County was adjourned last week until October 16. Justice Stephen Foster in Supreme Court granted the adjournment with the consent of counsel for both the commission and the six utility companies involved. The six companies seek an injunction to restrain the commission from reducing rates 6 per cent. One of the reasons for asking a stay, attorney for the utility companies said at a temporary injunction hearing at Albany, was that the rate cuts would cripple the companies in their efforts to live up to President Roosevelt's recovery program. The rate reduction was to have gone into effect September 1. Neile F. Towner of Albany, representing the utilities, advised the court that the commission had suspended the rate-reduction order until October 20, meanwhile reviewing the companies' arguments for a continuance of the present rates.

Estimates of added expenses to the electric companies of the Consolidated system, under the excise tax on gross incomes and increased water costs proposed by the city, were rejected by Milo R. Maltbie, chairman of the Public Service Commission, when counsel for the utilities sought to introduce the figures last week at the rehearing on temporary emergency rate reduction. Mr. Maltbie ruled that the figures were not relevant, since the rehearing order permitted only testimony relating to the effect of the NRA. Copies of the exhibits obtained from Jacob H. Goetz, utility counsel, showed that the estimated total amount of the proposed excise tax at 1½ per cent during the next six months would be $1,440,711. The proposed 50 per cent increase in water rates will make a total increase of $70,043 on an annual basis. The commission announced that the effective date of the rate reductions, first ordered for September 1 and then extended to September 22, would be further extended to October 20 because of the rehearing.

• Northern Indiana Power Company's new schedule of electric rates in Kokomo has been issued by the Indiana Public Service Commission. The order contains an adjustment of demand rates charged industries and provides an additional 24-hour service rate for larger industries. The schedule will require future customers to take cooking and heating service off the same meter which serves for light charges. It eliminates the two-meter service, but does not permit any penalty against users now having the special cooking rate. Hereafter cooking and lighting service will be supplied through one meter at a combined rate lower than formerly for lighting. The commercial lighting rate was cut one-half cent in the first two steps. The new large power rate for 24-hour consumers starts at 8 mills for the first 1,500,000 kw.-hr. a month and 7.5 mills for all over that. The consumer must guarantee a billing demand of 4,000 kw.-hr. a month.

• Possibility that the Indiana Public Service Commission may take action to abolish penalty charges for failure to pay utility bills promptly was indicated last week by Perry McCart, chairman of the commission. Recent rate readjustments made by the commission have eliminated penalties charged by utilities. Utility men, who are expected to oppose the plan when it is brought to an issue, maintain that the penalty system is universal throughout the country and that at least 90 per cent of the utilities operating in Indiana charge such penalties. A committee of public utility representatives has asked the commission not to take action in writing any general order affecting all utilities charging penalties until the committee has had a chance to plead the legality of the charges. Major utility rate cases affecting 26 Indiana cities and two big electric power systems are docketed by the commission for hearings within the next six months.

• Columbus Railway, Power & Light Company customers are entitled to reductions in their annual bills aggregating between $1,200,000 and $1,651,742, according to the report submitted last week to the City Council by J. Paul Blundon, who was hired by City Council to survey the company's books in an effort to effect light rate reductions. When a schedule is adopted it will be

submitted to the voters for approval at the November election. If the company accepts it it will become effective immediately after the election. If the company rejects it a fight in the utilities commission and the courts probably will follow.

Municipal Items

SAN FRANCISCO, CALIF. — East Bay utility district will drop its proposal of an application for Reconstruction Finance Corporation construction funds, following confirmation of the signing of a contract renewal with the Pacific Gas & Electric Company. Unanimous resolution of the district board has approved a twelve-year contract with the power company.

HUNTINGTON, IND.—Two ordinances passed recently by the City Council, both connected with the Council's desire to force a survey of the municipal light possibilities, have been vetoed by Mayor Dungan. One ordinance provided that three members of the Council constitute the board of works under a previous ordinance which "ousted" the present board. The other proposed to hire an attorney for the city and Council in its movement to build, lease or condemn a plant for the city.

AINSWORTH, NEB.—Attorneys for the city of Ainsworth have asked the Nebraska Supreme Court to dissolve the injunction recently issued by that court on application of the Interstate Power Company, which owns a plant at Ainsworth and which challenges the validity of a contract the Council entered into with the Fairbanks-Morse Construction Company for the erection of a municipal plant to be paid for out of future earnings (ELECTRICAL WORLD, August 19, page 228). The city attorneys say that the Nebraska court went on record, in Carr vs. Fenstermacher, 119 Neb., 172, as holding that the power to raise funds for a lighting plant are not limited to those named in the statute and that the power to pay for or improve lighting utility with available money on hand or with net earnings of the plant is implied by the general grant. They maintain that this settles the point in dispute, and that the municipality may use any reasonable means to give effect to a general power where there is no restricting provision.

SALT LAKE CITY, UTAH. — Popular ballot on the power plant question having become mandatory (ELECTRICAL WORLD, September 16, page 363), the campaign for passage of an ordinance has been started with the appointment of a committee of five members to plead the cause of a municipal system.

CULPEPER, VA.—Application has been made to the Public Works Board of Virginia for $160,000 with which to construct a municipal power plant having a capacity of 750 kw.-hr. Filing of the application indicated that the town has planned to release the Virginia Public Service Corporation service at the expiration of the current franchise in November.

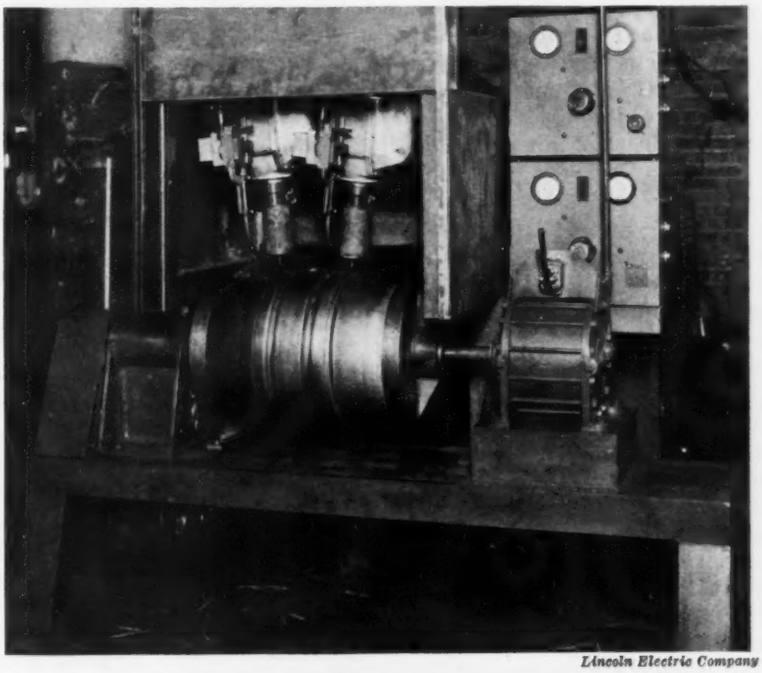
SALEM, MO.—In injunction proceedings brought before Circuit Judge Bowron by a resident of this city the question of the legality of a Missouri municipality borrowing money for municipal improvements from the Federal Public Works Administration under the national industrial recovery act, when such a loan would increase the city's debt beyond the constitutional limitation, has been raised. The action is directed against Mayor G. H. Slawson and other city officials from proceeding further with their application for a $40,000 grant and loan. The petition alleges the loan would increase the city's bonded indebtedness beyond the 10 per cent of the assessed valuation of property within the city limits. Last month the Missouri Supreme Court held that a contract entered into by Salem with Fairbanks, Morse & Company to purchase machinery for the light plant and to pay for same out of plant earnings was void because it created a debt in excess of the constitutional limit (ELECTRICAL WORLD, August 19, page 233).

DISTRICT OF COLUMBIA—Establishment of a municipally-owned power plant for the District of Columbia was recommended in a report made public last week covering a technical study of the question of O. M. Rau, a consulting engineer selected for the purpose by District commissioners at the instance of Congress. Mr. Rau estimates a saving of $4,000,000 annually in the cost of electric power service were a municipal plant built for the use of both the government and the public. Basis for savings not disclosed.

BIRMINGHAM, ALA. — As the first step in the fight against public ownership of utilities, opponents of that plan have completed the organization of the Association Opposed to Municipal Ownership, with Dr. Sterling J. Foster as chairman and treasurer. Birmingham will vote on municipal ownership and operation of the light plant and distribution system, the city steam heat plant, the street railway system and the water works system in the general election October 9.

MONTEBELLO, CALIF.—City Council has instructed the city attorney to apply to the federal government for a loan of $400,000 for construction of a municipal light and power system. The loan would be repaid out of revenues of the plant, according to the plan of the city officials. Montebello voters, at an election held August 1, defeated a proposal to issue $125,000 in bonds for the purchase or construction of a municipal electric distribution system (ELECTRICAL WORLD, August 12, page 201).

Thirty Beer Barrels a Day, Electrically



Lincoln Electric Company

Arc welding is now helping to make up an allegedly serious shortage in beer barrels at the rate of 8,000 a day, according to reports from steel keg makers. One machine of the unit type can produce 30 or more barrels daily, automatically welding both inner and outer shells of double shell types with complete success. The barrels revolve under stationary welding heads.

Utilities and the New Deal

Emergency measures centralize federal power.
State income lost and public injured by government ownership.
Selfishness must give way to public interest.

By PHILIP CABOT*

Harvard University

WE MAY as well face the fact that we live for the moment under a government of men rather than the government of law to which we have been accustomed. Our fortunes are at the will of the President. The agricultural adjustment act gave him sweeping powers of currency inflation which we know not how he will employ. We do not know and we cannot find out what our money will be worth tomorrow. The process of inflation has begun, but we do not know where it will end. Under such conditions long-term commitments or large investments in fixed property must, if possible, be avoided. If inflation is gradual your business will expand and you may be moderately prosperous until the time comes when you have to build a new plant. Then you will face a critical decision. If inflation is still going on, all investments in fixed plant are hazardous, because when the ultimate collapse comes the burden of your fixed charges may crush you. Currency inflation is the most tricky of all economic tools and, so far as I am aware, it has never been successfully controlled. The dangers which face you and all other men of business are undeniably serious. They are inseparable from the provisions of the agricultural adjustment act.

The national industrial recovery act raises other problems which you must face. For the first time in our history we are attempting national action on industrial problems. By the verdict of the last elections it was decided that the national government should assume control of the industrial and agricultural activities of the entire nation during the period of this emergency. The act suspends the operation of the anti-trust laws and appears to limit the sovereignty of the several states to an important degree. It is an experiment for a limited period. The aim of the program is to control production and raise wages and prices under the direction of the national government. This step was deemed essential in order to lift us out of the slough of despond into which we had fallen. Depression always results in making competition more severe. This depression has produced cut-throat competition of such a barbarous character that the nation was rapidly bleeding to death. After more than three years of it, the stamina of the nation was so weakened that something had to be done.

What the administration is trying to engineer is a form of modified competition similar in some respects to the system under which the public utilities have been operating for half a century. In these fields competition by substitutes has been very active; so active that in transportation the electric street railways have been unable to survive. The national industrial recovery act does not contemplate monopoly in any field, but it does contemplate regulation of competition, which the anti-trust laws made impossible.

No occasion for utility code

A clear vision of the whole panorama unobscured by political clouds would have disclosed that there was no occasion to bring the public utilities under the control of the National Recovery Administrator. They are already under adequate control. Selling below cost and wage cutting have not entered seriously into these industries, so that the effort to raise wages and prices and to prevent selling below cost, which are the major objectives of the national industrial recovery act, has little or no application in your industry. But the National Recovery Administration demanded that the utilities should come under its jurisdicton and they could not refuse. In this crusade to save the nation obedience is a prime obligation. This is no time for argument. In this crisis we should all obey the word of command.

The national industrial recovery act is clearly defined

**Abstract of address given at Pennsylvania Electric Association, September 8, 1933.*

as an emergency program limited in its operation to two years or less. But when the crisis has passed, how can normal conditions be restored? Although this is almost a question of life and death to this nation, there is an amazing lack of clear thinking about it among competent men.

As has been said, the national industrial recovery act and the agricultural adjustment act are wide departures from the forms of law and government to which we have been accustomed in the past. They suspend the operation of the anti-trust laws and they seriously infringe upon the sovereignty of the several states.

Personally, I approve of them as emergency measures because I think they were necessary to avert disorders which might have assumed revolutionary proportions. But as permanent measures I cannot believe that they represent the sober, or the final, judgment of the nation.

If that is true, this is the time to consider what the permanent measures should be which are to take their place. No time should be lost, for if these emergency measures remain in force for any considerable length of time we may find that the forces we have set in motion are beyond our control. The progress of recent revolutionary changes in Europe indicate that forces such as those set in motion by this recovery program gather momentum rapidly and may sweep away the structure of a government. It is true that this program is strictly limited in time, but already we are beginning to hear it whispered that the changes which it embodies will be permanent. Unless we are prepared to assent to that proposition the time for clear thinking as a basis for future action is here.

It seems to me unthinkable that the regimentation of industry and the control of personal conduct contemplated by the national industrial recovery act represent the sober judgment of this nation except as emergency measures. I do not believe that the voters have seen clearly what it means or how it would affect their daily lives. The Eighteenth Amendment was an experiment in the control of conduct. It was a colossal failure, and while we are in the process of repealing it, so as to retrieve that blunder, we have passed the national industrial recovery act, which would require a degree of national control of conduct beyond anything heretofore conceived. It is by no means clear that the nation is prepared to make such measures permanent.

Federal centralization at hand

There are many angles from which this program can be approached and many arguments on both sides. For obvious reasons I must confine myself to one aspect, namely, the extension of the powers of the federal government. The Constitution under which this nation has lived since 1789 made the states sovereign and the federal government had only limited powers delegated to it by the states. Failure to agree on the powers of the federal government was one of the causes of the Civil War, and there are many persons, particularly in the Southern states, today who have never assented to the solution attained by war. All that was claimed by the Northern states was the right of the federal government to maintain the integrity of the whole nation, but the implications of the national industrial recovery act and the agricultural adjustment act go much farther. In fact, they shift the center of gravity of the whole structure of our government. Formerly we have had 48 sovereign states, each largely independent within its borders, but the implication of the national recovery program is that the national government is now supreme and that when national and states' interests conflict the interest of the nation must control.

No reasonable person can deny that great changes have occurred since the keel of the state and federal constitutions was laid down, and many will, I think, admit that important additions to the powers of the federal government should now be made. The framework of this government was designed to fit a small nation living by fishing, agriculture and trade. Today we are perhaps the most highly industrialized nation in the world. At the outset there was no manufacturing. Today two-thirds of our population lives by industry or trade; only one-third is actively engaged in farming, and very few farmers can live on what they produce. Even farming has become an industry which must sell its product in competitive markets over which it has no control. This is only one of the radical changes in the life of the nation which has occurred during the last hundred years. Clearly we must study these changes and decide what adjustments should be made in our forms of government. When the problem has been calmly considered and a decision reached by the voters of the nation we can call a constitutional convention to record the verdict. But if we allow ourselves to drift with the tide of this emergency recovery program, as we are doing now, we may wake up some fine morning to find that events are in the saddle and that, while we were wrapped in the arms of Morpheus, our future and our children's future have been decided. The course of events in Europe since the war shows that this is not a morbid dread.

As a specific example of what might happen if the power to regulate industry were concentrated permanently in the federal government, take your own industry. In your case this may easily happen, because for many years there has been a school of thought which favored national regulation. The increasing volume of interstate traffic has added weight to the arguments of this school and the general attitude of the present administration is favorable to it. To this problem I shall now address myself, and for the purpose of my argument I shall practically disregard the interests of managers, stockholders and bondholders, except in their status as citizens. What I am interested in is the life

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This very thoughtful and stimulating address by Professor Cabot should be read by every one in the electrical industry. It is fundamental; it is a call to thought and action; it is written to care for the interests of the public as well as the industry. We agree with the principles and commend the conclusions—EDITORS.

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of the nation. Discussions such as this which relate to the structure of government are greatly simplified if they are looked at in broad perspective.

The total fixed investment of your industry of about eleven billion dollars is wholly located within the jurisdictions of the several states and the District of Columbia. For 30 years it has been growing very rapidly and now produces a tax revenue of more than two hundred millions a year to the states in which the fixed property is located. The item of tax revenue is too large to be treated lightly.

The railroads furnish a good example of what the ultimate result of federal regulation might be. Federal regulation of the railroads became necessary more than a generation ago because most of the traffic was interstate and was therefore beyond the power of the states to control. The Interstate Commerce Commission, to which the duty of regulation was committed by Congress, has been, on the whole, an able body. But under the statutes enacted by Congress the result has been disastrous. This result may be traced to two major causes—the determination of Congress to maintain competition between the railroads themselves, and competition subsidized by the federal government on both highways and waterways. Competition between railroads serving the same market is clearly unsound and contrary to the principle of regulated monopoly which is essential to the orderly development of the railroad industry. Unsound competition of this character has forced the carriers into large increases in operating expenses which might otherwise have been avoided, and also a gradual but continuous chipping away of rates. Between reduced revenues and increased expenses the plight of the railroads has now become alarming.

Competition subsidized by the government has also operated in the same direction. Much of the profitable short-haul business has been diverted to the highways and much of the low-grade freight has been diverted to the waterways, where it is carried at less than cost because the fixed charges on vast sums spent on river improvement by the federal government are not paid by the carriers, but are charged to the general tax levy.

The condition of the railroads is now such that the federal government has been obliged to loan them large sums of money in order to save them from bankruptcy. These loans were necessary because the savings of the people had been invested in the railroads on the faith of regulation by the federal government. In order to protect its large investment in the railroads the government may ultimately be forced to take them over.

I fancy that most of you will agree with me that government ownership of the railroads is not likely to benefit the nation. But from the point of view of the several states it would be a disaster because it would cut off at one blow a tax revenue of some four hundred million dollars a year and, to make matters worse, it would add such a vast number of voters to those already controlled by federal patronage as to jeopardize the freedom of the states and even the federal government itself.

These results of regulation of the railroads by the federal government under the direction of Congress are not accidental. They are inherent in the system and similar consequences are likely to follow if other public utilities are regulated in the same way. The ultimate power to regulate rests in Congress, which as a national assembly should think for the nation. In doing so the local interests of the states must take a back seat. National regulation of rates and competition with the carriers subsidized by the national government are both designed to benefit the consumer, but if, as in the case of the railroads, the profits of the regulated industry are taken away, the states lose more than the consumers gain. To this aspect of the situation Congress is somewhat blind. In order to protect its tax revenue each state must have prosperous and growing industries to tax, and under state regulation this result has been achieved. In the last 30 years the electric power companies under local regulation have grown by leaps and bounds and the states have shared the profit. In 1902 the total taxes paid by electric power companies were about $2,700,000; in 1931 they were more than $210,000,000.

State income at stake

Clearly the states will not kill the goose that lays the golden eggs for them. But the federal government, as shown by its regulation of the railroads, has no very keen interest in golden eggs laid in the nests of the states. Of all the geese, the electric power companies have been the best layers. Most of the revenue of the states is derived from taxes on real estate; that is, dwelling houses, office buildings, stores and factories. The only owners of real estate who have paid their taxes through this depression without flinching have been the public utilities. The railroads, which are under federal regulation, have been forced to borrow the money from the federal government in some cases and the other carriers have been hard pressed to pay their taxes out of their own revenues. Those utilities alone which have been under local regulations by the states have shown stability in this crisis. They are the most valuable source of tax revenues within the jurisdiction of the states and control of them should be jealously guarded. If they come under the control of the federal government the revenues of the states will ultimately suffer.

This threat to their revenues is perhaps the greatest danger to the states of federal regulation. But the consumers also are likely to suffer. What the consumers are interested in is rates and the regulation of rates is a marketing problem. In the long run the consumers will not benefit by being served below cost, because this will ultimately impair the quality of their service and prevent the healthy growth of the industry, thus decreasing the taxes which can be collected from the companies. Any one familiar with marketing knows that no two markets are alike, so that taking the United States as a whole there must be several hundred thousand markets for electric energy, each one of which must be considered by itself. This is obviously impossible under federal regulation, because no human mind can grasp problems of such diversity. Federal regulation must deal in generalizations. The whole nation must be sprayed with a fire-hose, as it were, without regard to whether any particular locality needs water or sunshine. Remote control of local rate problems would injure both the states and the consumers. The states would see their best sources of tax revenue gradually bled to death and the consumers as a whole would lose more in quality of service and the increased burden of taxation than they would gain in reduction of rates. Under such a

system a well-balanced development of the whole potential market in each local area would be impossible. Even now there is a bias toward one class of customers at the expense of another, and this tendency would increase as the power to regulate became more remote from the local consumer.

Competition by the government

There is another danger involved in federal control. The pressure on the federal government to undertake the development of hydro-electric power is constantly increasing without much consideration of whether there is a market for additional power at profitable prices. To this pressure the government often gives way because congressmen are impressed with the argument that small consumers will be benefited and these consumers have votes. Little thought is given to the fact that the value of existing power developments will inevitably be reduced, if not destroyed, and that, as we have observed, these are the geese that lay the golden eggs. If these are injured it is the states and the taxpayers who must ultimately bear the burden. When questions of this character come up in Congress the pressure is all on one side. The immediate interest of the consumers fills the eye, the power companies, of course, have no friends, and the interests of local communities and local taxpayers are lost sight of. The congressman is an opportunist by nature and training. There are few cases where opportunism is more dangerous than in cases where the rights of the states and the deep springs of tax revenues are concerned.

The vices of chiseling and of selling below cost are receiving almost daily attention from General Johnson. Undoubtedly they have done great harm. But very few people know that the federal government itself has been one of the worst offenders. Waterway traffic subsidized by the federal government is a case of selling below cost which has cost the railroad investors dear. The electric power to be developed at Boulder Dam and at Muscle Shoals is not now needed to supply the market; and it seems likely that the money spent on the Tennessee Valley project by the federal government will reduce the value of existing electric power developments in that region by a substantial amount. This loss will ultimately fall upon the states in the form of reduced tax revenue. The proposed development of electric power on the St. Lawrence River is another example of the same thing. At the moment the states seem blind to the danger which threatens them.

I have taken the electric power industry as an example of the dangers to which the principles of the recovery program would expose us if they were made permanent. Please do not misunderstand me. As an emergency measure this program was necessary and wise. But if we allow ourselves to be lulled to sleep by radio addresses of the President about the New Deal and appeals for co-operation by the National Administrator we may wake up some morning in a new world. As practical men we should face the fact that in this crisis we have made a long step in the direction of Fascism. The national government has taken control of all industrial and agricultural operations with our consent. Enormous power has been put into the hands of labor leaders. For the first time in our history labor now sits at the council table where decisions of prime importance are made.

All this may have been necessary as an emergency measure, but such concentration of power involves great risks. Unless we are prepared to abandon the forms of government under which we have lived, we must see to it that this situation is terminated at the earliest possible moment.

The question whether we shall abandon or greatly modify the principle of states' rights is perhaps the most critical, and upon the wise solution of it our future may depend. Probably we must admit that some additional authority must be vested in the federal government, but the country is so extended, the divergence of local interests so great and the total population so large that any movement toward cenralized control is attended with great risk. Fascism as practiced in Italy and Germany would probably break down.

The moment seems to me a most critical one, in which every man who loves his country should think deeply in order that he may act wisely. We have already drifted with the current too long. The industrial organizations which the Pennsylvania Electric Association represents have very large interests at stake which will be seriously threatened if they are brought under the control of the federal government. You will be told that there is no intention to interfere with the work of the states, but you will do well to remember that once the camel gets his head under the skirt of the tent his whole body shortly follows. This is the history of federal control in every field. At present the total volume of interstate traffic in electric power is not large. It could easily be eliminated if that were necessary to defend the integrity of state regulation. Without attempting to argue that the states have been completely successful in public utility regulation, it seems clear to me that our hope of improvement lies in strengthening the hands of the states and not in weakening them by dividing their powers with the federal government.

States' rights must be preserved

If you have followed the line of my argument and approve of it you may want to enlist in the army fighting for the states in defense of their freedom. But it is doubtful whether you can pass the recruiting officer, for if your assistance is to be of any value you will have to change the whole course of your life. We have been trained as individualists, and in the last analysis the philosophy of individualism is selfish. Outside of the small group that surrounds us we regard the world in which we live as indifferent or hostile. Your personal contacts with the officials who regulate your industry have been largely of a controversial nature. I do not mean that you have quarreled, but that you have looked after your company's interest and the commission has looked after the interest of the state and the consumer. If you are to be of any service to the state in this emergency that attitude must now cease. To serve the state you must forget yourself and the interests you have served. The habits of a lifetime must be reversed. To serve the state or any one else effectively you must be utterly selfless. Perhaps that is too much to ask, but I say to you in all seriousness that in this emergency that is your safest course. You will best serve your own interests and the interests of your company by forgetting them for the time being. Unless the freedom and the integrity of the states can be preserved there will be no freedom for any of us.

Revenue Shows First Gain in Three Years

For the first time since October, 1930, reports of revenue for electric light and power show an increase over the corresponding month of the preceding year. July operations, estimated at $154,860,000 for the entire industry in the United States on the basis of returns received by ELECTRICAL WORLD, were 1.6 per cent larger than in 1932. Revenue was larger also, by about 1 per cent, than in June; this is in contrast with a decrease at this season in every year during more than a decade.

Operating expenses, excluding taxes and reserves for depreciation, also rose 1 per cent from June nearly to the level of July, 1932. Energy output rose, bringing the daily average up to that of June, whereas there is normally a decrease. Compared with last year the extraordinary rise of 14.4 per cent is to be noted.

While the balance of revenue over operating expenses was somewhat greater than a year ago power companies have been confronted with higher taxes on which monthly statistics are not available, but which need to be borne in mind in considering the status of the industry. Total revenue for the first seven months was $1,091,730,000, against $1,161,910,000 last year, a decrease for the period of 6 per cent.

As to the rise in operating expenses, the increased production of energy from fuel was doubtless a contributing factor, for this item rose 11 per cent over June and 21.4 per cent over July, 1932. Production from water power declined, as is usual in midsummer, and constituted 37 per cent of the total. There was a marked increase in the amount of energy purchased for resale.

Regionally, revenue gains appear over last year in six of the nine geographical divisions. In May there were none; in June only two. New England and the East North Central States are ahead by more than 4 per cent. The gain in the latter was especially pronounced, being a reversal from the 1.3 per cent loss in June. The South Atlantic division approximately maintained the ratio announced a month ago. The Middle Atlantic, East South Central and Mountain regions crossed the line from losses to gains.

In the West North Central region revenue nearly matched that received a year ago against a disparity of 3.1 per cent in June. The West South Central and Pacific States continued to lag somewhat, but even in those regions the gap compared with 1932 has narrowed.

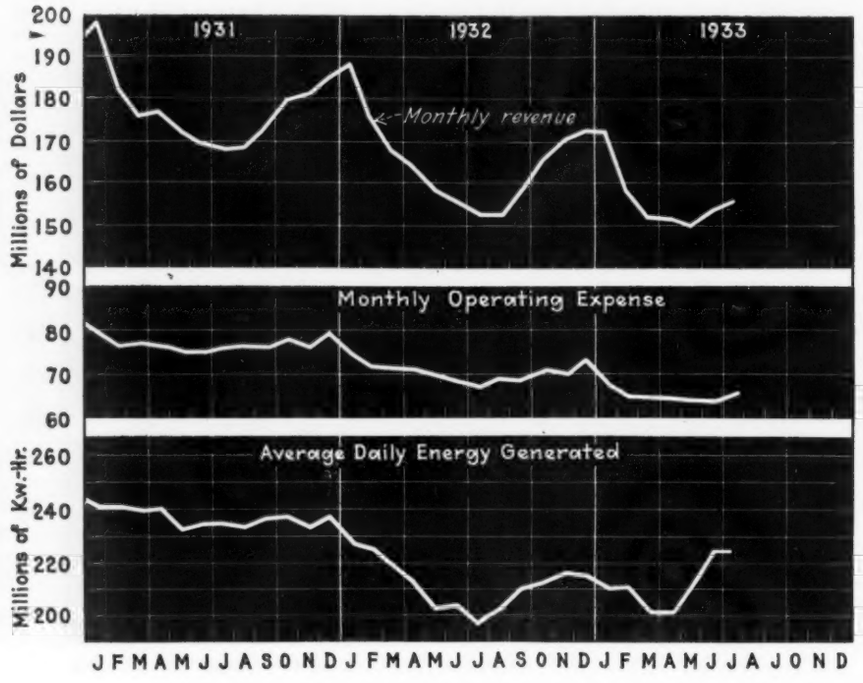

Table I—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1933	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
April	6,058,661	— 4.5	2,945,376	— 0.2	3,113,285	— 8.5	1,596,000	+ 1.3
May	6,577,167	+ 5.3	3,223,173	+13.3	3,353,994	— 0.8	1,709,000	+ 2.4
June	6,791,925	+10.4	2,827,014	+12.8	3,964,911	+ 8.9	1,739,000	+ 7.5
July	7,008,431	+14.4	2,617,667	+ 4.3	4,390,664	+21.4	1,922,000	+12.1

Table II—Regional Revenue, Energy Output in July, 1933

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	154,860	+1.6	7,008,431	+14.4	2,617,667	+ 4.3	4,390,664	+21.4
New England	16,270	+4.8	489,323	+27.8	142,106	—23.3	347,217	+75.0
Middle Atlantic	39,710	+0.8	1,719,759	+12.3	433,631	+ 1.3	1,286,128	+16.4
East North Central	36,670	+4.4	1,624,191	+22.0	130,881	+ 1.0	1,493,310	+24.2
West North Central	12,940	—0.2	457,515	— 1.5	110,624	—23.8	346,891	+ 8.1
South Atlantic	17,380	+2.5	821,670	+27.6	445,152	+34.3	376,518	+21.2
East South Central	5,040	+1.0	285,021	+ 4.0	237,467	+ 2.2	47,554	+ 8.0
West South Central	8,230	—2.4	381,378	+ 5.8	8,180	—32.3	373,098	+ 7.0
Mountain	3,630	+1.1	241,737	+24.0	203,364	+30.0	38,373	+ 0.6
Pacific	14,990	—2.5	987,837	+ 5.0	906,262	+ 2.3	81,575	+48.0

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central-station operations.

Table III—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

Month	Total Gross Revenue from Sale of Energy*		Total Operating and Maintenance Expense†	
	1933 Thousands	Per Cent Inc.	1933 Thousands	Per Cent Inc.
April	$151,420	— 7.5	$63,380	— 6.2
May	149,950	— 5.3	63,420	— 4.5
June	153,590	— 0.9	64,870	— 2.0
July	154,860	+ 1.6	65,590	— 0.1

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.

†Does not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions.

Better Standards Needed for Surge Testing

By F. D. FIELDER

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SURGE testing of high-voltage apparatus has become of great general interest and importance, as shown from the increasing number of surge generators in use, the extension of surge testing to all kinds of high-voltage apparatus, to provide data for the scientific design of transmission systems and the growing activities of various national committees on the subject. It is, therefore, highly desirable that all surge tests, whenever made, be performed on a comparable basis, because seemingly minor differences of technique in conducting them lead to appreciable differences in results. The purpose of this discussion is to outline a few of the known possibilities of error and to review methods of technique most conducive to comparable data.

Of first importance in any surge test is the shape of the applied wave. The A.I.E.E. subcommittee on lightning has recommended* a wave designation in which the first number represents the time from zero to crest value and the second number represents the time from zero to half crest value on the tail. There is not complete agreement on the propriety of this definition, and at the present time departures from it are used. Hence, surge data can be of comparative value only when the wave shape is completely defined.

The A.I.E.E. wave definition does not state the nature of the wave as it progresses from zero to crest value and down through half crest value. The logical assumption, however, is that the variations are the natural ones occurring in a properly damped circuit; calculations and tests show that a surge generator delivers an open circuit wave which is fundamentally the difference of two exponentials, one determining the front and the other the tail. Actually, when a surge generator is correctly adjusted, additional complications slightly change the nature of the front of the wave, but the tail, which is of more importance, is purely exponential after the crest. Ideal waves with exponential tails (Figs. 1 and 2a) should be the aim in any surge test and should be the standard of comparison. These waves are designated as 1.5-40 ms. and 1-5 ms. waves, according to the A.I.E.E. definition.

Damping resistors affect wave shape

In practice it is natural that ideal waves cannot always be obtained. Surge generators produce a natural wave with considerable oscillation on the crest, often lasting several microseconds, and it is necessary to insert series damping resistors to obtain smooth waves. If the resistors are too low in value, or if they are not properly located, the result is a departure from the ideal wave in the form of an overshoot. This can be of brief duration as in Fig. 2b, due largely to series resistors too low in value, or of longer duration, as in Fig. 2c, which sometimes occurs when the series resistors are improperly located. In addition certain types of loads cause circuit oscillations and the resulting waves depart from the ideal. Series resistors too large in value cause undesirable rounding of the crest and a lengthening of the wave front. Although Figs. 2b and 2c are drawn on the basis of a 1-5 ms. wave, similar departures from the ideal also occur with other waves. The errors resulting from the use of irregular waves appear to be proportionally smaller with longer wave tails.

When it is necessary to use waves which are not ideal, what is the resulting effect on surge measurements? Tests have shown that when flashover occurs on the tail of the wave the flashover depends on the effectiveness of the tail.† Small variations of short duration which occur on the rise or on the crest of the wave have no appreciable effect on the flashover. Thus, an overshoot on the wave crest, as in Fig. 2b, has no noticeable effect

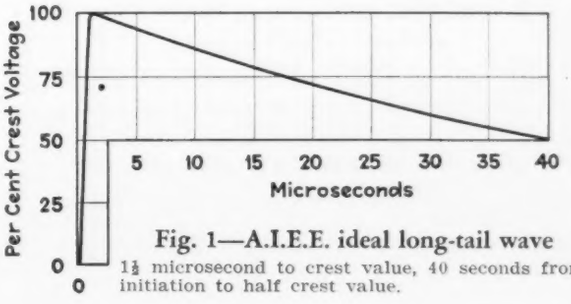

Fig. 1—A.I.E.E. ideal long-tail wave
1½ microsecond to crest value, 40 seconds from initiation to half crest value.

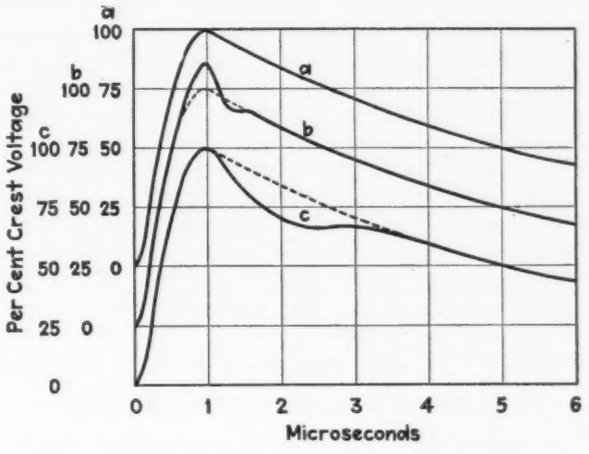

Fig. 2—Ideal 1/5 wave and its practical variants
(a) The A.I.E.E. wave taking 1 microsecond to reach crest and 5 microseconds to decline to half crest value.
(b) Oscillation on the crest, coming from inadequate damping resistance.
(c) Dip on tail, resulting from improper location of damping resistors.

*Electrical Engineering, January, 1933.

†"Technique of Surge Testing," F. D. Fielder, Electric Journal, February, 1933. "Laboratory Measurements of Impulse Voltages," J. C. Dowell and C. M. Foust, A.I.E.E. paper, January, 1933.

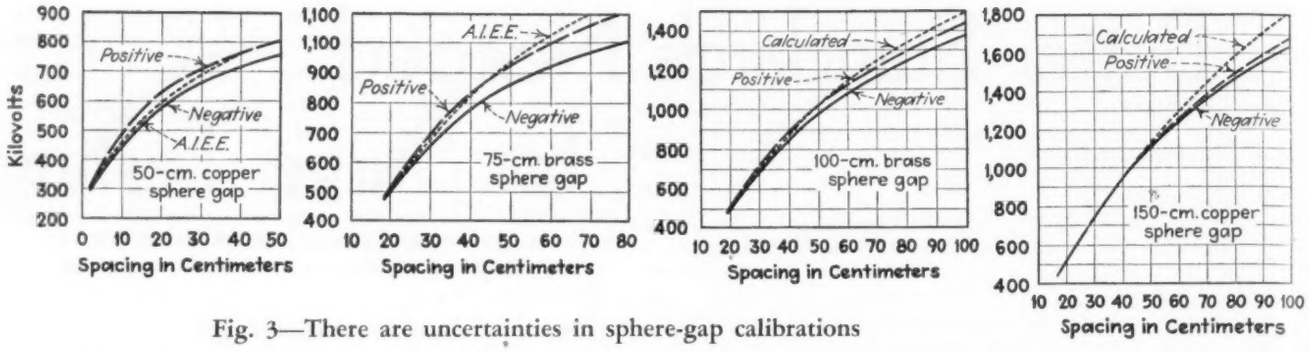

Fig. 3—There are uncertainties in sphere-gap calibrations

Surge tests (1½/40 wave) on the larger spheres show definite departures from calculations based on A.I.E.E. 60-cycle standards for the smaller gaps.
These tests were made by taking about a dozen oscillograms of the minimum flashover voltage at about ten different spacings for each gap. Positive and negative waves with rises of 1½ microseconds and tails of 40 microseconds to half crest value were used. In many cases flashover took place two or three microseconds after the crest of the wave, thus insuring both smooth wave conditions as well as elimination of errors arising from the possible divider inaccuracy on the rise of the wave. Of additional value was the consideration of full wave values indicating the highest voltages which could be applied without causing flashover.
All oscillograms were carefully analyzed and checked against the surge generator charging voltage. The sphere gaps were made of copper or brass and conform with A.I.E.E. recommendations in most respects.

if it is of short duration. Because the tails are practically identical both the overshooting wave and the ideal wave are the lowest magnitude waves which will cause flashover, even though the crest values are different by about 10 per cent. However, in the case of Fig. 2c the wave tails are not equivalent and tests have shown that, when the ideal wave will just cause flashover, the distorted wave of the same crest voltage will not; the magnitude of the distorted wave must be increased until the two tails more nearly correspond. These facts are of importance in comparing results between laboratories, since all three types of waves are encountered in practice. It follows that the method of analyzing the data of any surge test has a direct bearing on the results.

Deviation from standard must be stated

To amplify further, let it be assumed that a cathode-ray oscillograph system is used which will record the voltage magnitude and wave shape perfectly in all respects. Then oscillograms will show the actual wave in any test, and if the wave departs from the ideal the amount of deviation will be known. The problem is how to interpret the oscillogram when the wave is not standard so that the results will be comparable to results of other laboratories in which the wave shape may be standard or may depart from the standard in a different manner. Since the presence of short-time disturbances on the crest of the wave has little effect on the flashover of apparatus, correct analysis becomes a matter of estimating the crest value of the equivalent standard wave. Values obtained in different laboratories by this method will check each other, if other conditions are the same. In the case of greater divergence from the ideal wave, as in Fig. 2c, the estimation of equivalent standard waves becomes more difficult; although approximate estimates are possible, it is desirable in this case to correct the generator circuits to improve the wave. Naturally standard waves should be used whenever possible; when the standard is unattainable generator circuits should be modified until the minimum amount of departure is obtained.

It is not easy to obtain perfect recording of the wave on oscillograms, as in the above assumption. Two possible faults in resistance-divider systems are, first, nonfidelity of the resistance ratio, due to the capacity of the resistance unit to ground, and, second, modification of the waves because of cable losses. Because of these faults it is conceivable that a wave with a 5 per cent overshoot can be recorded as a smooth wave, even with apparently good equipment.

Errors in a well-designed divider system occur only on the front and crest of a wave; the wave tail is recorded accurately, mainly because the rates of change are much slower. Correct oscillogram analysis will, therefore, produce comparable results, because correct analysis is based on the tail of the wave, and the tail of the wave is the accurately recorded portion on the oscillogram. Briefly, standard waves and perfect oscillograph reproduction are desirable for every test, but in cases where these ideals are not attained added precautions in the analysis are required before the results can be compared with similar results of other laboratories.

Sometimes sphere gaps are used to determine flashover values of apparatus by connecting a sphere gap in parallel and adjusting the spacing until flashovers alternate between the apparatus and spheres on consecutive shots. Since the sphere gap measures the actual crest value of the wave in practically all cases, it is evident that the use of the sphere gap without additional check methods can lead to considerable error when the wave differs from the standard. The sphere gap would indicate different results for the minimum flashover value of a given piece of apparatus with the different types of waves previously discussed. The wave of Fig. 2b would result in values 10 to 15 per cent higher than the standard wave of Fig. 2a, while a rounded wave would produce results slightly lower than the standard wave.

Sphere gap calibration important

Thus, if a sphere gap is to be used for surge voltage measurement one of two conditions is required: Either the wave shape must be ideal, or, if it is not ideal, the amount of departure must be accurately known for every test to provide correction factors for the sphere gap readings. Both of these conditions require a practically perfect divider and oscillograph system, since in the first case the possession of an ideal wave could not be determined without a perfect recording system, and in the second case the actual wave shape in all of its particulars must be shown. The conclusion, though it seems para-

doxical, is that the real limitation of the method of surge testing with sphere gaps in parallel is the difficulty of procuring a positively perfect cathode-ray oscillograph and divider system. Much greater accuracy is required than demanded by oscillogram measurements based on wave tail records.

An additional difficulty in the use of sphere gaps in parallel with apparatus for surge measurement is the uncertainty of calculated sphere gap calibration curves. Available calibration curves at present are the A.I.E.E. 60-cycle standards for gaps up to 75 cm. in diameter and calculated curves for larger gaps. Surge tests with a resistance-cable divider system have shown departures from these curves, especially for the smaller spheres. A set of calibration curves showing positive and negative wave surge tests on 50, 75, 100 and 150-cm. sphere gaps are shown in Fig. 3.

The curves indicate that in certain cases errors can arise from the use of A.I.E.E. 60-cycle curves or from calculated curves. Past discrepancies between different laboratories could have arisen in part from this source. Since the error appears greatest in general for moderate spacings of small gaps and large spacings for large gaps, the largest available sphere gap should be used in a given test if sphere gaps are to be used at all.

The cathode-ray oscillograph and a resistance-cable divider system have been used at the Trafford Laboratory for high-voltage surge measurement for five years. Comparison of its response with the independent capacity divider system together with calculations of its performance have increased confidence that it produces results of great reliability. Also in favor of this system is the readiness with which time lag curves can be obtained without modification of either the system or the method of analysis. Time lag curves certainly give more information on the impulse characteristics of apparatus.

Logical recommendations

1. It is recommended that standard wave definitions be amplified fully to describe ideal waves which can be used as the standards of comparison.
2. When standard waves cannot be attained a uniform method of analysis should be employed to yield comparable data.
3. Sphere gaps should be used for surge measurements only in conjunction with a perfect cathode-ray oscillograph and divider system.
4. Sphere gap calibration curves for surge voltages should be accurately determined and standardized.
5. A well-designed resistance divider system and cathode-ray oscillograph should be the primary standard of surge voltage measurement.

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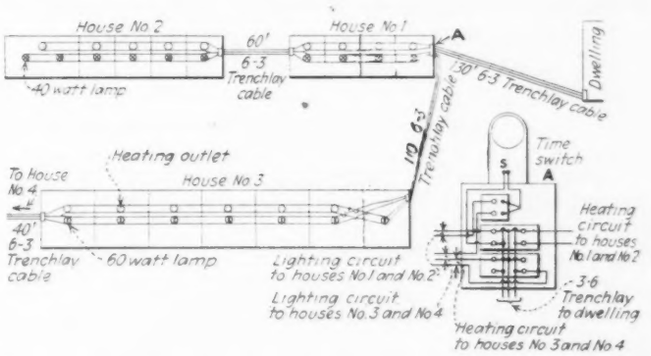
Poultry House Wiring Amortized in One Season

Flexible metallic conduit, well-arranged convenience outlets and a simple switching layout enable the poultry farm of Ivar Larsen, Carlisle, Mass., to enjoy the benefits of electric service in four chicken houses with a total capacity of 3,000 laying hens on an economic basis which liquidates the investment cost in a single winter season. The installation was made at the owner's request according to plans prepared by the rural service division of the Boston Edison Company. The scheme of wiring is shown herewith for a typical portion of the poultry house area.

From the cabinet "A" in house No. 1 110 ft. of three-wire, No. 6 B. & S. trenchlay cable feeds houses Nos. 3 and 4 (the latter not shown) and also houses Nos. 1 and 2. Longitudinally through each house are run two circuits of No. 12 copper, arranged by paralleling the inner sides of each to form an electrically equivalent three-wire, 115-volt neutral. One pair of wires serves for lighting and the other for heating service. The neutral is formed where a change is made to trenchlay cable to pass from one building to another. The lighting outlets are provided with ten 40-watt and twelve 60-watt

Approximate Material Costs Chicken House Wiring

350	ft. 3-wire No. 6 B & S Trenchlay cable at	$0.13	$45.50
750	ft. No. 12 B & S 2-wire "BX"	3.75	28.12
6	6x9-in. fuse boxes	0.40	2.40
1	6x12-in. fuse boxes		0.50
1	60-amp., 3-wire cutout		0.45
2	3 to 2-wire cutouts	0.50	1.00
1	cutout		0.13
42	3-in. galvanized KO boxes	0.04	1.68
20	pin point receptacle covers	0.15	3.00
22	socket covers	0.10	2.20
93	connectors		1.70
	Total material		$86.68



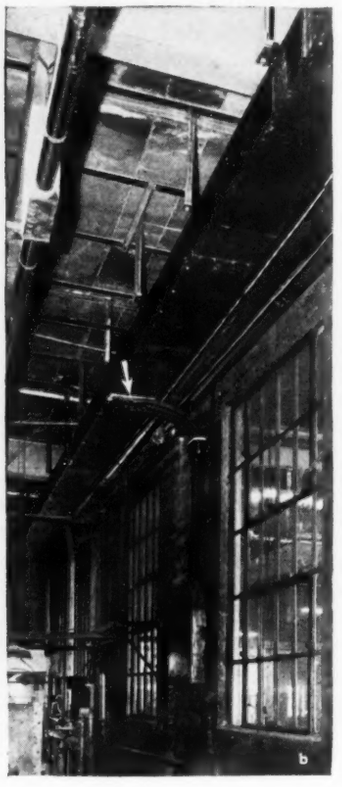
Two extra eggs per year pays the whole cost of this wiring

lamps and are controlled automatically by a time clock at "A," which is set to turn on the lamps in winter between 4 a.m. and daylight, on the basis of insuring the hens thirteen hours of total illumination per day. The arrangement of fuses shown in the diagram enables the operator of the farm to disconnect either lighting or heating circuits in either set of houses, but no switches were used on account of the danger of inadvertent opening of a heating circuit. The disconnecting is done at the fuses themselves. Heater switches are manually controlled.

The installation includes a 1,000-watt storage brooder, five Colony brooders of 500 watts each, three 300-watt incubators and twelve 45-watt poultry water heaters. The outlets provide for the installation of a brooder in any pen, a light and water heater in any pen, or a brooder and light in any pen. The capacity of a typical 20x20-ft. pen is from 150 to 200 hens. On the basis that the production per laying hen is increased by two eggs per season, the installation cost will be more than covered in one season. The approximate increase in operating cost of electricity in the four houses in January and February, 1933, over the same period last year was $35.

Aluminum Busbar for Plant Feeders

By CLARENCE HOLTHAUS*
Plant Engineer Aluminum Industries, Inc.



Knockouts at frequent intervals along the cover permit clamping load taps to the busbar at the most convenient point. The trough and inclosed busbars are supported every 4 ft. by hangers, double hangers being used where adjacent trough sections join.

Fig. 1 a and b—Sections of aluminum-inclosed aluminum busbar showing load taps

Aluminum busbar inclosed in aluminum trough has been installed recently in the Cincinnati plant of the Aluminum Industries, Inc., to extend 220-volt, three-phase service from the switchboard to a point 240 ft. away. It has a carrying capacity of 2,500 amp. In the course of this run the busbar had to pass through an adjacent building to a third building, the trough being attached to the wall or ceiling, as most convenient. Flexibility of use and economy were the chief reasons for using this construction.

Its flexibility is indicated by the fact that it was impossible, at the time of the installation, to determine where taps would be needed for various loads. However, all that was needed was to provide knockouts at frequent intervals along the trough cover so cable taps could be clamped to the busbars at the most convenient point.

As told to Francis Westbrook.

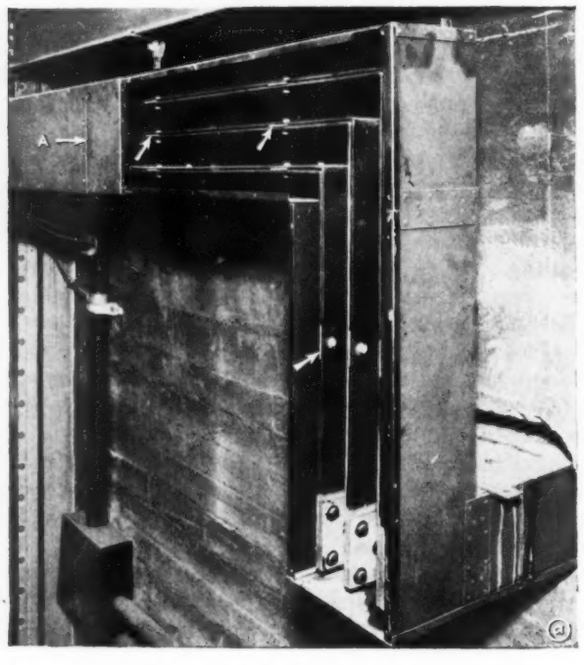
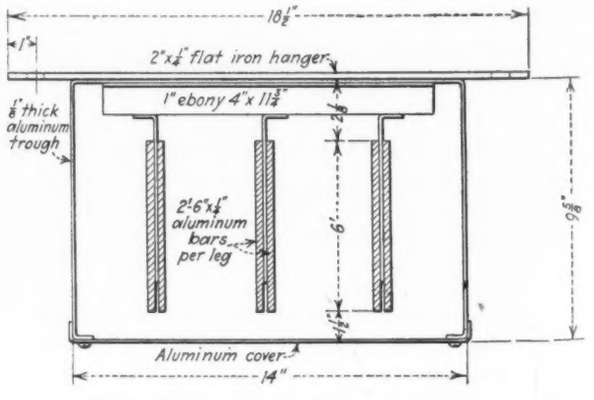


Fig. 2 a and b—Method of supporting busbars inside trough

Clamped between each pair of busbars at frequent intervals are L-shaped flat-metal bars, the shorter legs of which are attached to 1x4x11⅞-in. ebony bars secured to the top or side of the trough, depending on whether it is supported by the ceiling or wall. Note one of the knockouts (marked A) for connecting load taps.



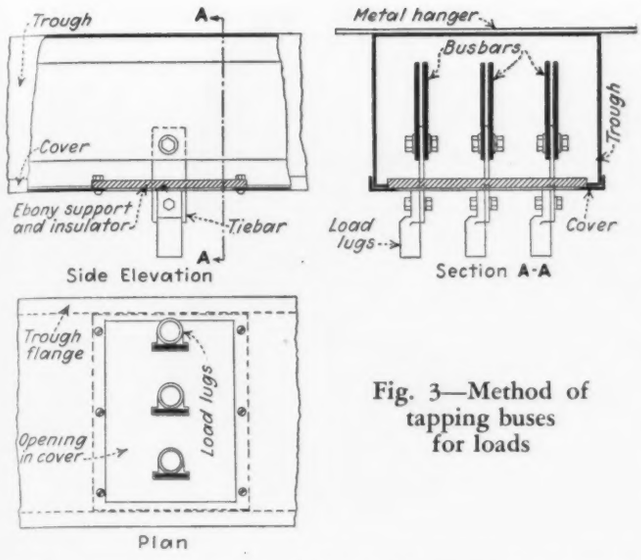


Fig. 3—Method of tapping buses for loads

Both economy of installation and economy of operation were involved. With the heavy currents that are handled the aluminum trough and cover greatly reduces the reactive voltage losses which would be incurred with trough of magnetic material. Because aluminum busbar has a greater cross-section and radiating surface than an equivalent-conductivity copper bar, the heat dissipation is better.

Under the circumstances involved and with this particular combination of aluminum busbars and trough the cost of labor and material was found to be less than with any other busbar construction or conduit wiring system considered. The ability to purchase aluminum bars in long commercial lengths reduced the number of bolted joints, thereby reducing labor and also minimizing contact resistance. The light weight of the bars reduced freight charges, aided handling during installation and minimized the wall or floor loading. It should be recalled that for equal conductivity the weight of aluminum is only half that of copper.

Less susceptibility to corrosion from acid fumes was another characteristic of aluminum that influenced its selection.

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Revised Silk Mill Drive Brings Benefits

By C. W. TURNER

Sales Manager Connecticut Power Company

The somewhat unusual three-year program of the Armstrong Silk Corporation to convert all looms from group to individual drive was completed early in 1933. This company, formerly a unit of the Corticelli Silk Company, had approximately 400 group and 100 individual drive looms in the early part of 1930. For some years the ability to produce much higher quality fabrics on the individual motor-driven looms caused the management to consider the merits of complete conversion to individual drive. Early in 1930 the prevalence of small orders for quick delivery emphasized the lack of flexibility inherent in group drive, and as a result the management authorized a complete conversion program in spite of the extremely unsettled character of general business conditions at that time.

Although difficult to evaluate in dollars, the following accepted advantages of individual drive were felt to justify the capital expenditure:

Constant speed with consequent elimination of seconds and defects.

Better lighting—either more light for the same dollars or the same light for less dollars. This item on single-shift operation is in the order of $2 to $3 per loom per year assuming accepted levels of illumination.

Elimination of oil drip and dust. Since oil and grease stain cannot be removed from fabrics made from synthetic yarns the elimination of oil and grease drip from weave rooms producing these fabrics is extremely important.

Elimination of dust carrying air currents.

Elimination of belt replacements and maintenance. The extremely variable weather conditions in New London were found to produce abnormally high maintenance costs.

Elimination of hazard.

Flexibility—ability to run small units when needed.

Simplicity of maintenance—"trouble shooting" much simpler with individual motors.

While the foregoing improvements might alone justify the conversion, it is of interest to analyze the estimated figures of power consumption and production. From test data compiled by the Westinghouse Electric & Manufacturing Company from similar conversions in other plants, and from tests in this plant, it seems fair to assume that the result of motorization of an average group drive is approximately 3.5 per cent speed increase, accompanied by approximately 13 per cent increase in power required. Power loss in the pinion of the individual motor is around 4 per cent and the motor efficiency about 82 per cent. Hence the power input for individual drive is approximately:

$$\text{Input} = \frac{\text{Loom power required}}{0.82 \times 0.96}$$

$$= 1.275 \times \text{Loom power required.}$$

For the group drive in this mill no one would deny 25 to 30 per cent shaft loss and motor efficiency of 90 per cent. Hence, the power input for group drive, using the more optimistic figure of shaft loss, is:

$$\text{Input} = \frac{\text{Loom power requirement}}{0.90 \times 0.75}$$

$$= 1.48 \times \text{Loom power required}$$

For ordinary light fabrics the loom power requirement at 140 picks per minute would be in the neighborhood of 0.3 kw. with group drive. Application of individual drive would increase the speed to 145 picks (3.5 per cent) and power requirement to 0.339 kw. (13 per cent). Converting this to input for group vs. individual drive we have:

Group drive input per loom $= 0.3 \times 1.48 = 0.444$ kw.
Individual drive input per loom $= 0.339 \times 1.275 = 0.432$ kw.

In other words, the conversion could be expected to result in 3.5 per cent production increase accompanied by 2.5 per cent decrease in power consumption. For single-shift operations, per loom, production per annum is around 4,000 yd. of fabric, so that the production bonus for conversion to individual drive is in the order of 140 yd. of fabric per year per loom.

While "increased production" was a sadly outmoded sales weapon in 1931 and 1932, it, nevertheless, fortified the decision to accomplish the conversion when material and installation prices were at extremely low levels. Consequently the project was undertaken on a two-to-three-year basis using the regular maintenance force.

Tell About Taxation

By W. C. MULLENDORE*
Executive Vice-President Southern California Edison Company

Increased taxes jeopardize the future of electric service.
No reason exists for discriminatory taxation.
Citations of unjust policies.
What should be done.

YOU know that I do not exaggerate when I say that the wholly unreasonable use of the powers of taxation applied to the utilities today threatens the impairment of their service, the extension of their facilities and, furthermore, endangers literally hundreds of millions of dollars of savings invested in these properties by the real owners of the companies—the hundreds of thousands of citizens who are wholly or partially dependent upon those savings for their livelihood.

We are compelled, frankly, to face the fact that this condition has been intensified in this year 1933 by the duly elected representatives of these same people, the investors and customers of the utilities—representatives who, in the halls of the United States Congress and in the legislatures of the various states, have levied additional discriminatory and unbearable taxes, despite the strongest protests which we, as managers, could make against those impositions.

I was one of those who, in May of this year, appeared before the finance committee of the United States Senate and presented the facts which showed why the transfer of the 3 per cent federal electric energy sales tax would place in jeopardy the interests of the owners and users of electric utility properties. Before that committee there appeared William Hagenah, representing the Edison Electric Institute, and in a masterful and exhaustive presentation of undisputed facts and figures, taken from public records, Mr. Hagenah proved that such a transfer threatened the very injuries which it is now apparent will result from that action. At that same hearing many others appeared, representing investors in the utilities and individual companies, presenting with all possible vigor other inescapable facts which supported Mr. Hagenah's contentions.

After these facts were thus presented the tax bill was amended on the floor of the Senate, not to lighten the burden, but greatly to increase it by making it apply exclusively to the privately financed companies and by exempting the politically owned competitors of all the companies represented at that hearing. That is to say, the viciousness of the tax was increased manyfold by so imposing it as to make it much more difficult for the companies protesting it to bear the increased burden.

Reason for discrimination

And what reasons were assigned for this action of the Congress? So far as we are able to judge from the utterances of those chiefly responsible for the action, the reasons were twofold: First, that to impose the tax on the politically owned business enterprises of governmental units would mean increasing the cost of their service, and, second, that it should be imposed upon the institutions in which individual savings were invested because managers and employees of private companies had been guilty of the "high crime" of protesting against the extension of tax-exempt and governmentally subsidized competition. In other words, the essence of the argument was that: Because the imposition of the tax on politically owned plants which now pay no taxes would increase their costs, they should be exempt, but those companies which were already paying heavy taxes and which serve the mass of users of electricity should be required to pay, apparently without regard to the effect upon their ability to serve. Further, that because the savings of some citizens had been lost, the savings of millions of others should be placed in jeopardy by one of the most violent abuses of the taxing power which history records. Because representatives of these companies had dared to protest against unfair competition, that unfairness should be still further increased.

And while this was going on in Washington other representatives of the people who own and are served by the electric utilities, meeting in state legislatures in various states of the Union, were still further increasing the tax burden on these utilities and enacting still further discriminatory and restrictive legislation to hamper them in their operations.

These facts which I am stating are not disputed. They cannot be disputed. They are written where all who will may read. Yet they are so contrary to justice, so paradoxical and so inimical to the public interest that we must credit their existence either to ignorance or to an almost unbelievable prejudice on the part of those who are responsible for their existence. And while we are speaking frankly and attempting to face facts, we should point out that this unfair treatment was in part the result

**Abstract of address presented before Pennsylvania Electric Association, September 7, 1933.*

of the belief that the utilities are unpopular and that the public would approve, if not applaud, such action, because some people are unaware that it is the public interest which is thus placed in jeopardy.

The tax problem as applied to all citizens and all industry is one of the most serious of the many serious problems we are facing today. The portion of the national income taken for taxes has risen in less than one generation from one-twelfth to one-third. Taxation has drained and is draining purchasing power of the people generally to such an extent as to stifle the distribution of goods and the flow of trade. The specter of taxation and of unbearable tax bills has greatly increased that fear which freezes the channels of commerce.

But I repeat that, great as is the burden elsewhere, there is no realm of human activity where taxes threaten more extensive harm than the field we represent.

American civilization, as we know it today, is dependent on the flow of a reliable and cheap supply of electric energy. Not only does it light our homes, it turns the wheels of industry, and it performs millions of tasks in our daily activities in the home and in commerce. Hence the difficulty we have in believing that a deliberate policy should be followed which tends to prevent the conservation and development of this agency of everyday human activity.

Rates have declined

Lest it be thought that I exaggerate, let us review other facts with which most of you are familiar, but which, like those to which I have already directed attention, are so beyond belief that we can credit them only by keeping them before us in all their stark reality.

The statistical bulletin of the Edison Electric Institute for August, 1933, points out that since the depression began the percentage of each dollar of electric consumer revenue taken for taxes has increased from 9.7 cents to its present annual rate of about 14 cents. From 1929 to 1932 gross revenues of the electric utilities from all consumers declined from $1,938,000,000 to $1,832,000,000, but in the same years the tax bill rose from $187,500,000 to $217,000,000. Now in this year 1933, when the gross revenue, because of declining volume of business and further rate reductions, will apparently be further reduced to not more than $1,750,000,000, the annual tax bill is running at the rate of $250,000,000.

One of the arguments advanced by those who have attempted to justify these radical increases of utility taxes is that the rates for electric service have not declined, as have the costs of other things entering into the cost of living, and hence that the utilities should be taxed to compensate for the lack of rate reductions. What is the fact? We have heard a great deal about bringing prices back to pre-war levels. Domestic electricity costs now stand at 35½ per cent *below* the 1913 average, while the cost of living index of the United States Bureau of Labor Statistics at the end of 1932 was still 32 per cent *above* pre-war figures. And now when the anti-utility agitators are attempting to bring great popular pressure for further rate reductions, the costs of living in other directions are rising. But have there been reductions in electric rates since 1929? The answer is emphatically yes, and the reductions have been of a very substantial character. In the year 1929 the average cost of electricity for household use was 6.33 cents per kilowatt-hour. In June, 1933, this cost had declined to 5.56 cents per kilowatt-hour. Thus, while taxes were increasing 44 per cent, the average rates for domestic electric service were declining by 12 per cent, and this notwithstanding the fact that in 1929 the rates for domestic electricity were already more than 27 per cent below the 1913 average, while the cost of living was then 71 per cent above the 1913 average.

If the average cost of domestic electric service had followed the cost of living curve the rate last year would have been 11½ cents per kilowatt-hour instead of 5.56 cents, or more than twice the actual 1932 figure. No more baseless, unfair and deliberate misrepresentation of fact is in common circulation today than that the electric utilities have not met their obligation to the public in the matter of reducing rates. And when the cost of electricity is used as an argument for increasing utility taxes, in the face of these facts, it is evident that the proponent of such an argument is having difficulty in finding facts to support an untenable position.

There are a number of other striking facts which enable us to measure the comparative burden of utility taxes. Ours is both a manufacturing and a distributing industry. There are few, if any, such industries in which the tax bill equals or approaches the cost of the raw material.

The cost of the raw material for producing electric energy—fuel or falling water plus labor—is no greater, and in many cases is less, than the tax per kilowatt-hour delivered to the consumer. The tax burden per kilowatt-hour on one of the large companies with whose costs I am familiar in 1925 was 1.26 mills. But in 1933 the tax burden will be more than 2 mills.

A large Western company has a payroll of $15,000,000 and a tax bill of $10,000,000; for every dollar and a half paid to workers it pays the government one dollar in taxes. Another Western company has a tax bill equal to $1.54 for every share of common stock outstanding—a $25 par value stock paying a $2 dividend.

The company with which I am associated pays 37 varieties of taxes, fees, licenses and permits. In the list we find the familiar items of gross receipts tax, franchise tax, federal income tax, capital stock tax, electrical energy tax, sales tax, dividend tax, stock transfer tax, bond transfer tax, gasoline tax, bank check tax, telephone and telegraph message tax and numerous state taxes and fees. The man who compiled the list added a footnote, "We do not pay excess profits tax."

Subsidized competition from taxes

It would seem that with the utilities being asked to bear these tax burdens for the support of governmental activities, and in view of the public interest in the maintenance of utility service, common sense would dictate a careful protection of these important revenue-producing agencies from other unfair treatment, if for no other reason than to conserve such an important source of taxation. But here again we find an unexplained paradox.

The most destructive feature of taxation as applied to the utilities is its use for the purpose of actually destroying and putting out of business the tax-paying units in favor of governmentally subsidized and non-taxpaying units.

More wit than that was certainly shown by the tyrants of old who imposed burdensome taxes, but yet en-

deavored to keep their victims alive in order that they might bear future impositions.

I have already referred to the action taken by the last Congress in imposing the 3 per cent federal energy sales tax on the tax-paying privately financed utilities and exempting the non-tax-paying, politically controlled utilities financed with tax money and public credit. That was but an addition to the situation which already existed, but it was of course an addition which was of the utmost seriousness because it increased the differential in operating costs resulting from tax exemption to a point where no business could continue for long to compete, however much might be the difference in efficiency of operation in favor of the tax-paying unit. If it is the purpose of those who have created this differential to make it impossible for the tax-paying utilities to continue to operate against such tax-exempt competition, I for one am quite willing to admit that they are in sight of the achievement of their goal. I made such a statement last spring before our state Legislature in California and it was greeted by the advocates of political ownership with great acclaim as an admission of the failure of private ownership. If to admit that private ownership cannot continue with such handicaps is to admit that private ownership has failed, then let the admission be made.

But this discrimination in the use of the taxing power is only a fraction of the story.

Not only are the politically controlled power plants wholly free from the crushing burden of taxation, but the tax money collected in part from the tax-paying utilities is turned over in certain notable instances to politically operated units to be used by them in building competing plants.

Now there is a story which should rate a prominent position in any collection of stories of political tyranny.

The funds of taxpayers who are unable to finance their own business, to expand their own operations, because of tax burdens and other business conditions, are being taken by their governments and diverted in part to the construction of additional power facilities in a nation which is today provided with a great overcapacity in power facilities.

Again, let's turn to the record: In the year 1929 the generating capacity of the electric light and power industry in the United States was 28,389,649 kw., and in that year the total energy sold to ultimate consumers was 75,294,467,000 kw.-hr. In the year 1932 the total generating capacity was 33,334,700 kw., but the demand on that increased capacity had declined to 63,764,024,000 kw.-hr. Stated otherwise, the industry as a whole operated at an average of 26.3 per cent of theoretical capacity in 1932, as against 36.2 per cent of theoretical capacity in 1929. We did not need any additional generating capacity in the United States to meet the exaggerated demands of the boom year 1929. Today we have one-sixth greater capacity and one-sixth less demand and hence one-third more surplus capacity than we had in 1929.

It is hard to believe that in the face of such facts, and in the face of the extreme difficulty of the taxpayer in meeting his bills, tax money and public credit should be used to build more power plants to add to an already great surplus, to compete on a non-tax-paying basis with tax-paying plants, and thus to destroy the earning power of property belonging to thousands of citizens, and to deprive the governmental treasuries of the taxes which otherwise would have been paid by the tax-paying plants, thus closed down by governmental competition. Fantastic and impossible as such cases would seem, we nevertheless find just such projects as I have described being pushed forward actively in more than one section of the country. I need only to mention the names of Muscle Shoals and of Columbia River. I could name others. And new schemes by the score are being suggested each week in states, cities and other governmental subdivisions both small and large.

The justification for these destructive uses of the powers of taxation are even more feeble than those advanced for tax exemption and other tax discriminations. One is that a greater supply of cheap electric power will help us to grow industrially and thus revive prosperity. No one believes more in the value of a cheap supply of electric power than we do, but when the country is confronted with a huge surplus of cheap electric power and a surplus supply of industrial capacity, as well as of energy of all kinds, including human energy, it is something more than ludicrous to advocate, as the road to prosperity, the expenditure of public money to add to the supply of electric generating capacity. Of course if the road to the production of wealth is the destruction of wealth there may be something in this theory, but I find it difficult even in this day, when economic laws are being rewritten, to believe that wealth can be created by destroying it. Another favorite argument advanced for using tax money to build a brand new power plant alongside another modern plant which is standing idle for lack of demand is that the government needs a yardstick by which to measure the cost of electric energy. To answer that point one needs only to consider the palpable absurdity of measuring the cost of a service which must pay its own way by comparing it with the costs of a service which is subsidized by the taxpayer.

We are also hearing much of the vital importance of sustaining and of increasing purchasing power. Is it too much to expect that recognition shall be given in these critical days to the obvious fact that the safeguarding of savings wisely invested in useful property is an important item in our endeavor to conserve and increase purchasing power? If the government ignores the sacrifices of those who in the past have denied themselves present enjoyment in the interests of their future security, then not only is purchasing power destroyed, but the incentive to further saving is removed. The opportunity to work is dependent upon the continued existence of places in which to work. If in attempting to provide work by the construction of new plants, new office buildings and new systems of transportation, we make impossible the continued operation of those already in operation, the purchasing power of those now employed in the existing business is at least seriously endangered.

Why pay dividends?

There are those who urge that dividends should not be paid in these times. But what are dividends? They are simply and only rental paid for the use of property purchased with somebody's savings. If dividends should be stopped rents should be stopped. And when govern-

ment taxes out of existence the payments for the use of property, it has destroyed the incentive to the creation of capital goods—buildings, electric plants, railways and other similar improvements upon which civilization is dependent. Once grant the premise that the payment for savings endeavors may be denied with impunity and these conclusions inevitably follow.

Of course, it is argued that no such dire results are intended. Unfortunately, good intentions do not prevent the natural human reactions to wrong policies. If any one thinks that these policies of overtaxation, of governmental competition with business, of denial of the opportunity for property to earn a fair return do not result in the stoppage of the flow of savings into such properties, let him endeavor to entice the investment of money in new enterprises where such conditions obtain today.

Past losses do not justify penalties

Some of the most prominent and persistent critics of our industry have expressed great concern for those who lost their investments in the collapse of institutions which had invested in equity stocks of the light and power companies. Although these losses were not due to mismanagement of operating power companies and although the losses have not fallen upon the rate payers, we can all agree that these losses were most unfortunate. But is it not more than passing strange that these same critics who are so concerned for those who have lost should now be assisting in every movement which is designed to cause loss to the investors in operating companies? Such inconsistency strongly suggests that these critics are far less interested in protecting the savings of their neighbors than they are in seizing upon certain spectacular but exceptional failures of concerns dealing primarily in securities as an excuse for unreasoning condemnation of companies that primarily manufacture and sell electricity. Indeed, these unwarranted attacks upon investments in operating utility companies have been made without discrimination and with such utter abandon as to indicate a feeling that all such investments are contraband and subject to confiscation without compensation.

What should be done

But I hear some one saying: "All of that is true and we agree with you, but why tell us? Here you are talking to people who know these facts. Why not tell those who do not know, or who fail to recognize these facts? We are talking only to ourselves." That is very true, but I have said these things merely as a prelude to this suggestion, which is the only excuse I have for having thus taken up my time and yours:

I propose that we should tell and retell this story, state these facts to the people who are primarily interested, namely, to our consumers and the hundreds of thousands of people who own these properties which we manage, to the people who use these properties and to those who have sacrificed that they might be used. That is our job. If we don't tell them, no one will.

The moral of the railroad story is plain. The task before us is to see that our stockholders and our consumers are told that their properties are threatened with the same injuries which have befallen all who are interested in railroads, and that while the destruction of the private utilities may mean the jobs of some of us, it is going to mean a much greater injury to the public interest represented by those users and owners.

I am advocating that we tell our story and tell it in plain and unvarnished fashion to our stockholders and consumers, because it is their property which is at stake. If they do not believe us; if they prefer to listen to the siren song of the demagogue, prattling of power trusts and the terrific threat to the American home of the monthly electric bill of $2.36, at least our duty will have been discharged. We have been kept too busy dodging bricks.

It is high time to do something about it. We have been deterred by the fear of our facts being branded propaganda. We have been fearful that we could not get a hearing. Yet we are constantly in touch with those who are most interested, our consumers and stockholders. It is part of our duty to keep these consumers and stockholders advised of the conditions of their property and service. And if they won't believe us; if they can't trust us, then they should replace us with some one in whom they can believe. Nor should we be deterred by a fear of the effect of some plain talking upon the market prices of utility securities held by the public.

If the millions of consumers and owners of these properties are awakened in time to the protection of the true public interest in these properties, the truth should have no permanent adverse effect upon security prices. In no event can we be excused for failing to use all the means at our command for reaching those whose interests are at stake. If we do, if we proceed diligently and earnestly and at once, I am convinced the threatened destruction can be and will be averted and we can once more devote ourselves to the single purpose of improving and advancing our service.

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Power Plants Have 44,590,815 Kw.

Public utility plants and plants operated in connection with manufacturing establishments and with mines and quarries in the United States have a combined rating in excess of 44,000,000 kw., and the total motor horsepower mounts up to a figure almost as large. Both would be increased somewhat if data could be included on the generators in non-industrial private plants and on motors in power plants, but that information is not available.

The following tabulation is based on the most recent government statistics—the U. S. Geological Survey report for public utility plants (including railway and other plants contributing energy for public use) for 1932 and the Census of Manufactures and Census of Mines and Quarries, both for 1929:

	Generator, Kw.	Motor Horsepower A	Motor Horsepower B
Public utilities	36,060,593	.....	.....
Manufactures	7,793,875	22,775,664	12,376,376
Mines and quarries	736,347	4,771,818	1,352,981
Total	44,590,815	27,547,482	13,729,357

A Motors operated on purchased energy.

B Motors operated on energy generated by establishments reporting.

New Service-Entrance Cable Co-operatively Developed

A new service-entrance cable, which has been developed in co-operation with a large number of utility companies for use from the point of attachment of service wires to the service entrance switch, has just been announced by the merchandise department of the General Electric Company, Bridgeport, Conn. The construction of this cable, designated as "AEIC service-entrance cable," is illustrated with some of the fittings developed especially for it. It is reported to be durable in all climates and to combine extreme flexibility with maximum mechanical protection. The clean conductors, coupled with the ease of stripping armor and overcoat insulation, make installation simple.

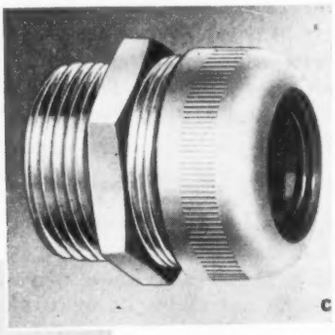
Some of the outstanding advantages claimed for this cable are:

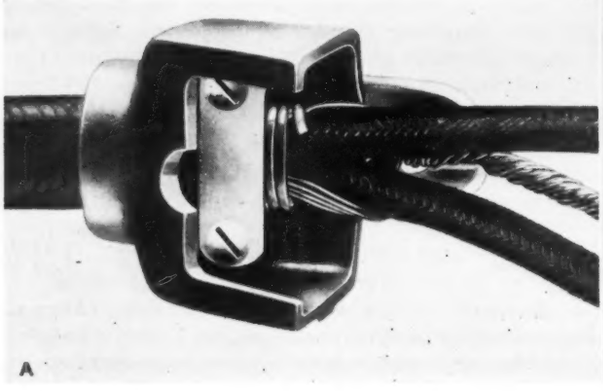
1. Greatly reduced weight and size over the present type of service-entrance cable.
2. Conductors are easily identified by distinctive colors.
3. Assembled armor and conductors are clean, since no pitch is used in assembly.
4. Conductors require no cleaning with solvents before making connections.
5. All conductors are stranded, resulting in an extremely flexible cable.
6. Bare conductor in form of strands is concentrically wound and equally applied over insulated conductors.
7. Theft-proof assembly.
8. A slight pull with the hand removes the armor—no hacksaw is necessary.
9. All weatherproof outside of armor and conductor assembly. This armor receives same weather protection as conductor.
10. Overcoat easily laid back without soiling the hands.
11. Fittings are attached over the weatherproof covering. This saves time in installation and eliminates the possibility of moisture penetration.
12. Pleasing dark brown in color, changing to gray upon exposure.
13. Will take any ordinary house paint.

A metal strap in the entrance cap clamps tightly over the armor and conductor, providing an excellent ground. Two split insulating bushings make it unnecessary to thread the cable through the bushings. The entire cable passes through the new connector and a soft-rubber bushing clamps it tightly around the overcoat, insuring a weather-proof connection.

Acceptance by the Underwriters' Laboratories and many tests have demonstrated the adequancy and safety of the cable.

Construction of AEIC service-entrance cable





Fittings developed for new cable

A—Strap clamps tightly over armor, insuring excellent ground of armor and bare conductor.
B—Split insulating bushing eliminates threading wire through bushing.
C—Rubber bushing clamps snugly around overcoat, insuring watertight connection.

Engineering Aspects of Coal Dust Control

Problems of storage piles and conveying systems for major steam plant use. Boiler plant and stack discharge questions considered.

A RECENT report filed in the Norfolk County Superior Court by Arthur P. Hardy, as master in the case of Brooks, et al., vs. the Edison Electric Illuminating Company of Boston, contains many engineering references of interest to designers and operators of large utility steam plants in connection with problems of coal dust, cinder and ash control. The master's analysis of the case, taken in connection with various engineering testimony heard by him, possesses much interest in relation to practicable methods of minimizing the effect of very large coal-burning plants upon the atmospheric situation in their vicinity.

The suit was brought on the ground that since the company began to operate its Edgar station in North Weymouth in 1925, the plaintiffs have been inconvenienced by the fall of coal dust, cinders and ash upon their premises. The master was obliged to decide whether such material stored or produced upon the company's premises came upon the premises of the plaintiffs; whether, if so, this constitutes a nuisance, and whether the plaintiffs have suffered damage and to what extent, if any. The master's conclusion, after many hearings involving the testimony of more than 90 witnesses, and visits to the plant and vicinity, was that the maintenance and operation of the Edgar station does *not* constitute a nuisance, although material from its coal field and stacks causes inconvenience to the plaintiffs and may, if the court later approves, be the basis of various allowances in the way of compensation. It is unnecessary here to review the legal aspects of the case or the reasoning which led the master to suggest certain awards for the court's consideration. The main value of these proceedings to the engineering reader is found in certain steps taken by the company to control dust inconvenience and stack emissions and various points brought out in relation to neighboring plants.

The Edgar station property comprises about 40 acres of land and 20 acres of flats bordering on Weymouth and Fore River, a tidal inlet of Boston Harbor, some 10 miles from the city proper. On the shore opposite the plant are the noted shipyard of the Bethlehem corporation and a steam-generating plant of the Eastern Massachusetts Street Railway. A few small coal-handling and selling concerns are located on the waterfront. In the complaints emphasis was laid upon dustfall, etc., on a peninsula (Germantown) occupied by residences and farms, roughly north of Edgar station and in round figures about one-half to three-fourths of a mile from its plant and coal field.

The company admitted that coal dust, cinders and ash are to some extent blown by the wind upon the defendants' premises from its own property, but denied that this occurred in any substantial amount. It contended that its equipment and method of handling coal from vessels to the storage yard and to the generating station are the most modern known to the art, and that its plant still represents the most up-to-date, efficient and practicable machinery for producing steam-generated electricity and preventing the discharge of cinders and ash from its stacks.

Outline of coal-handling facilities

New River coal is received by the company by water, the wharf accommodating a vessel carrying a cargo of 13,000 tons. The unloading machinery is electrically driven, but otherwise is similar to that in common use on the Atlantic seaboard. The fuel is delivered by traveling tower and conveyor belt equipment either to a storage field or to bunkers above the boilers. The present ground storage capacity is about 100,000 tons, and the field is served by a gantry bridge 250 ft. long, having about 600 ft. of travel and with the bridge bottom 34 ft. above ground. The storage field is located between the generating station and the territory occupied by most of the plaintiffs.

The capacity of the coal-handling system is about 400 tons per hour, and according to testimony by F. S. Clark of the Stone & Webster Engineering Corporation cost $1,447,942 up to 1926, when steps costing $22,194 were taken further to minimize dustfall, cinders and ash. The generating plant capacity was 72,000 in 1925, with three 375-lb. water-tube boilers aggregating 5,922 hp. In 1926 a 1,360-kw., 1,200-lb. turbine-generator was added, with a fourth boiler, bringing the boiler rating to 7,495 hp. Later the generating capacity was increased to 157,860 kw. in turbine units (1929), with eight boilers totaling 11,907 hp. No additions have been made since, as the execution of a primary power contract with the New England Power Company (service began in 1930) in connection with the construction of the Comerford station at Fifteen-Mile Falls and the advent of the depression enabled the Edison company to avoid enlarging its generating facilities.

From 1925 to 1930 the generated output at Edgar station increased from 110,875,400 kw.-hr. to 626,231,000 kw.-hr. The boilers (B&W) are equipped with Taylor underfeed stokers. The distance from the fuel bed to the top of the furnace is about 24 ft. The four later boilers were constructed to operate at 1,450 lb. Forced and induced draft are provided and there are two types of cinder catcher in use (Carty and Sturtevant) and two brick stacks, each 18 ft. in inside diameter at the top and 251 ft. above the ground level.

100,000-ton storage field

The master's report pointed out that the engineers who designed and supervised the construction of the Edgar station carefully studied the question of coal dust, and that the adoption of the electric drive for the handling system eliminated the dust and cinders associated with the steam operation of towers and conveyors. By the belt conveyor system adopted by the company the coal is deposited practically without agitation from the towers upon the conveyor in a continuous stream

and runs undisturbed from there to the point where it is unloaded on the storage pile (maximum height of pile about 30 ft.) and not in considerable bulk, as is the case with a railway or cable car system. The belt conveyor system is less dusty than where cars are carried on a trestle.

The company considers it necessary to maintain at least two months' supply of coal on hand to meet contingencies and keeps from 55,000 to 65,000 tons on hand at all times, the report states. It points out that the coal is stored without covering in the open air and that no fence surrounds the field, although on the water side of the conveyor there is a galvanized-iron fence about 4 ft. high installed as a windbreak to prevent coal being blown from the conveyor. The largest amount of coal in storage at any one time was 80,735 tons.

Plaintiffs made the open-air storage of this large amount of coal the basis for one of their complaints. Soon after the Edgar station began operation complaints were received from residents of the area before mentioned and the company made a number of changes in its machinery and method of unloading and handling coal. Among the more important were the following:

(a) Orders were given by the company for the wetting down of the coal before loading into vessels at Newport News, Va., for water transport to Boston. When this was not done (on rare occasions) the coal was sprayed by water while in the grab bucket in the hold of the vessel and while being raised to the boom on the tower. Few if any of the plaintiffs complained that any objectionable amount of coal escapes from the grab bucket, and the master found that no substantial amount of coal dust is discharged into the air between the vessel's hold and the towers.

(b) The sides of the hopper into which the coal is dumped from the grab bucket were raised, confining the dust cloud arising from this operation to the hopper.

(c) Asbestos-protected material was provided over the feed-belt hopper of both towers. The spouts from the hoppers were lengthened to bring them closer to the conveyor belts.

(d) The company made a telescopic end on the hopper on the gantry bridge so as to lengthen the chute through which the coal must pass through the hopper on the gantry bridge to the storage pile. In this way the chute may be extended or shortened as required, thus reducing the amount of air space throguh which the coal must descend in falling.

(e) At all points where coal is transferred from one belt conveyor to another, such point of transfer has been inclosed in the attempt to prevent the discharge of coal dust into the air. The crushing machinery in the breaker house and belts conveying the coal from the breaker house to the station bunkers have likewise been inclosed.

(f) Brushes were installed to detach from the surface of the belt conveyor equipment any dust remaining after the coal had been dumped.

(g) Trees were planted on the street running between the generating plant and the coal field, as a windbreaker.

(h) Certain cast-iron gratings were replaced by concrete slabs and scupper openings were filled with wooden blocks.

(i) A vacuum-cleaning system was installed along part of the conveyor and tower system.

(j) A sprinkler system was installed on the gantry bridge, consisting of an arrangement of perforated pipes through which water is conducted from hydrants installed on one side of the field and sprayed upon the storage piles. This causes a crust to be formed on the sides of the coal piles and holds down and anchors dust which otherwise would be driven upward in swirls by wind action.

Coal coverage too costly

During the hearing of the case the plaintiffs made a number of suggestions as to further preventive measures for consideration by the company and its expert witnesses. One of these was that the coal pile might be sprayed with oil or calcium chloride, but the master pointed out that no evidence was introduced that either of these methods is any more practicable than those used by the company. Another suggestion was that a high fence might be built around the entire coal yard or that a building like a Zeppelin hangar might be erected within which the coal might be stored. Another plan was to divide the storage yard into a series of bins.

Mr. Clark testified that a structure adequate to house the coal stored would have to be about 150 ft. high, with a roof supported by trusses without intermediate columns. The hangar would have to be about 600 ft. long by 330 ft. wide, and the cost of erecting would be about $1,155,000, exclusive of the expense of moving the existing coal pile to permit the construction of the building foundation and its beams in the coal storage area.

The cost of a fence 38 ft. high entirely surrounding the field would be about $52,000, and there was little indication that this would prevent the rise of dust from the inclosed piles; in fact, it might aggravate the blowing of coal dust through creation of drafts. It was considered probable that a fence 60 ft. high around the field would prevent to a considerable degree the blowing of dust, but this would cost $250,000.

Subdivision of the yard into pockets would materially decrease the storage capacity and result in inefficient and expensive storage and handling of the coal.

Another suggesiton was that the yard be divided by a fence running through the entire longitudinal center with a transverse fence running laterally and crossing the first at right angles substantially in the center, thus forming four yard divisions. This, again, would detract from the handling efficiency and increase the cost of coal storage and movement, and no evidence was presented to show that this plan would reduce the blowing of coal from the piles. The master found that no direct evidence or evidence brought out under cross-examination indicated that the company was not utilizing the best known methods of producing a minimum amount of coal dust.

John Hunter, consulting engineer, St. Louis, Mo., testified that wetting the coal is much more effective in dust prevention than inclosing the storage piles with a fence. Questioned as to the efficacy of storing coal under water, he said that if the Edgar station used but 100 tons per day this would be satisfactory, but with consumptions running at times up to 800 tons per day under-water storage would be impracticable. Such a course would call for an area almost as large as that occuplied by the coal piles, and about 10 per cent of the New River coal stored by the Edison company would be lost in under-water storage.

Boiler plant and chimney problems

The property of the plaintiffs is for the most part located from 3,200 ft. to 3,800 ft. from the station stacks. Microscopic examination of the material deposited on their premises showed it to be composed of coal dust, cinders, coke, ash, vegetable fibers, sand, wood and other material. The ash was not comparable to ashes from an anthracite coal fire, but was visible only under the microscope and consisted of glass globules or fibers. The bulk of the material was black coal dust, cinders and ash. It should be repeated that the company admitted that a portion of the dustfall came from its coal field and stacks, but that it contended that no substantial amount of the total so originated.

The engineers who designed and built the station were instructed to effect a resulting installation which would not annoy persons living in the vicinity. The Edgar station was one of the first in the country to install cinder catchers and expended $97,290 for eight boilers.

The plaintiffs suggested the use of pulverized coal or oil instead of bituminous coal. The master stated that the evidence does not warrant a finding in favor of such a change, or that anthracite coal could be used with any better results than New River. If oil were substituted for bituminous coal, the cost of making the changes required would be about $1,200,000, exclusive of the cost of writing off or discarding the present equipment, or the cost of restoring it if it became necessary to re-

sume the burning of coal. The changes in equipment necessary to substitute No. 3 buckwheat anthracite would cost about $800,000, and it would be necessary to use about 20 per cent more anthracite than bituminous coal, increasing the cost of operation. The Edgar station operates on approximately 1 lb. of New River coal per kilowatt-hour generated.

To change the station to pulverized coal, as suggested by the plaintiffs, and install a Cottrell precipitator would cost about $2,100,000. Mr. Clark testified that when the Edgar station was designed pulverized coal was considered, but it was believed that fly ash would give as much trouble as New River bituminous coal properly burned. To utilize the Cottrell precipitator it would be necessary to reinforce the building structure to carry the weight of this device. The master found that so far as the evidence went, this precipitator has never been used in connection with the elimination of cinders or ash produced by a coal-burning plant unless pulverized coal was consumed.

The Carty cinder catcher cost $44,135 installed and the Sturtevant cinder catcher for two boilers cost $25,900, and $27,252 for the last two. Mr. Hunter testified that each type of cinder catcher appeared about equally effective at this station. Preheated air (to about 400 deg. F.) is utilized at Edgar station, and this tends to coke the coal in the fire bed and so to prevent the discharge of the finer particles of fuel from the bed surface. The gases are passed through preheaters and economizers en route to the stacks. This witness stated that the Cottrell precipitator is ineffective to catch the small amount of cinders produced by burning pulverized coal, but does catch the fly ash.

The master found that economy of operation was the primary consideration of the designing engineers of this station and that the methods adopted when it was built were then novel to a degree and have been copied elsewhere; also, that the economy of the station ranks among the best in the art, despite its eight years of service. He pointed out that while the substitution of oil as a fuel would eliminate the presence of coal dust, cinders and ash from the air, it remains undeterminable on the evidence whether or not the burning of oil would result in a heavier discharge of smoke and cinders into the atmosphere, with depositing of oil on the surface of the waters of Fore River, which flow along the shores of Germantown. The master concluded that the question whether or not the company ought to be required to incur the heavy expense incidental to equipping the plant for oil burning should be determined by the court.

Influence of adjacent plants on dustfall

The Edison company contended that a considerable portion of the dustfall of which the plaintiffs complained originated in adjacent plants and premises within range by prevailing winds. Only a brief summary of this phase of the case can be given here. On the shore of Fore River opposite the Edgar station and several hundred feet nearer Germantown is a steam plant of the Eastern Massachusetts Street Railway, situated, roughly, southwest of Germantown. This plant was built in 1904 and for seventeen years nothing but bituminous coal was burned by it. From 1904 to 1917 its two stacks were each 125 ft. high, and following complaints from Germantown of inconvenience from dust and cinders, each stack was raised to a height of 175 ft. From 1921 to 1924 fuel oil was burned in place of coal, and then coal was burned until 1928. From then until 1931 oil was used, and once more coal was substituted after that time. There are ten boilers, half of which are equipped for coal and half for oil burning.

The railway company sells power to the Fore River shipyard and receives coal usually in 4,000-ton steamers at a wharf 200 ft. long by 100 ft. wide, with steam-driven unloading machinery supplied from the plant boilers. The coal is not wet down and a local coal company shares the yard facilities, averaging 40,000 tons per year wholesale bituminous business. The maximum coal in the yard has been 13,000 tons and the yard capacity is about 17,000 tons. This plant consumes about 2.15 lb. per kilowatt-hour, against about 1 lb. at Edgar station. Its boilers are provided with forced draft and fired by Taylor stokers. It has no sprinkling system for coal and no cinder catchers. The yard has a fence about 12 ft. high on two sides only. The master found that some coal dust, cinders and ash reach Germantown from this plant and field. The Edison company contended, on the basis of elaborate studies by Weather Bureau experts as to prevailing winds, and of the accumulations in dustfall stations under the direction of Prof. C. H. Berry of the Harvard Engineering School, that the dustfall in Germantown could not have come from Edgar station except in small amounts during the 5 or 6 per cent of the year when the wind blew from the south, or directly from the station and the field to the plaintiffs' area.

The master disagreed with the company's contention, basing his conclusions upon the testimony of the plaintiffs that the dustfall increased after Edgar station began operation, and he held that even with the more scientific and nearly complete combustion of the Edgar station the total quantity of cinders and ash emitted from its stacks is greater than in the railway plant. This, he maintained, is due to the far greater total consumption of coal in Edgar station, although he conceded that the farther west the wind, the less likelihood of dustfall from the company's plant.

The dustfall station in the Germantown area was in service 40 weeks, one sample being accumulated per week. Computations based on these readings indicated dustfalls ranging from 53 tons to 3,487 tons per square mile per year, with an average of about 1,000 tons. This, the master stated, would give a depth of about $\frac{1}{64}$ in. over the entire square mile. The smallest amount of dustfall noted was at the Newton, Mass., substation of the Edison company, in a residential district where the average of 54 samples gave 107 tons per square mile per year. On Dorchester Avenue, Boston, the dustfall averaged 2,285 tons per square mile per year. Neither at Newton nor Dorchester Avenue was there any connection with Edgar station operations.

In conclusion, the master found that it is not incumbent upon the plaintiffs, as urged by the company, to show the proportion of dustfall originating elsewhere than at Edgar station. The report declared that the company had never had any intention of creating or maintaining a nuisance and that it has adopted all practical means known to the art to reduce, so far as possible, such inconvenience. No way was disclosed of entirely eliminating stack cinder and ash discharge except by entailing the enormous expense of changing to oil fuel, and without tremendous cost the complete suppression of dust from the coal field cannot be achieved. None of the conditions described are detrimental to health, and the master declared that his report should

not be allowed to give the impression that the atmosphere in and about Germantown is today heavily impregnated with smoke, dust and cinders. During the eight days when hearings were held in Germantown no pall of smoke was observable over, in or around the place. On two days when witnesses testified that the conditions were as unfavorable as at any time, the master observed clouds of dust arising from the company's coal field and smoke issuing from its stacks. The final conclusion was that the company is conducting a lawful business in a lawful way; that its plant is in a semi-industrial residential area, and that the inconveniences alleged are associated with living in such a neighborhood.

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Electrophysical Concepts Being Modified

Intensive study of the cosmic rays still goes on and many new and interesting facts have been announced recently, notably in connection with the various meetings celebrating the Century of Progress. Old conceptions are being rapidly upset and new ones have to be adopted almost monthly as the papers appear. Recent studies have concentrated on the positron, which is a particle of the size and mass of the electron (or now, as it is proposed to call it, the negatron), the charge of which, as indicated, is positive. Up to the time of the discovery of the positron it had been assumed that a positive charge was associated only with the much heavier proton or nucleus of an atom which had lost an electron.

The definite evidence of the positron is the photograph of its ionization path in a Wilson expansion chamber, which is caused by the explosion of an atom in the wall of the chamber, as caused by the impact of the cosmic rays. The direction and radius of curvature of the photographic trace of the particle in a magnetic field indicate the charge, the mass and the velocity of the moving particle. Such collisions and explosions liberate both negatrons and positrons and it is easy, even for the layman, to appreciate what a stimulus experiments of this character must give to the student of nuclear physics and the promise that they offer for further light on the nature of the cosmic rays, and particularly on the heart or nucleus of the atom.

The most recent announcement is an example of the rapidity with which amazing and sometimes revolutionary results are appearing in this field of study. If cosmic rays can generate positrons and negatrons, why should it not be possible for other well-known types of rays to do the same thing. This, as a matter of fact, has been tried using the highly penetrating gamma rays of thorium. These experiments have the enormous advantage that these rays are well understood and the values of their photon energy well known. The experiments have shown clearly the generation of positrons and negatrons by the gamma rays, and since it is possible to compute the energies not only of the incident rays, but also of the resulting positrons and negatrons, a comparison is possible. It is found that the amounts are closely the same, and while further confirmatory experiments are still necessary, the astounding conclusion is indicated of the direct conversion of light into electricity.

READERS' FORUM

A Discussion of Fuses

To the Editor of the ELECTRICAL WORLD:

The article entitled "Co-ordinating Fuses and Relays for Distribution Reliability," by G. F. Lincks, in the July 29 issue of ELECTRICAL WORLD has been read with interest. There are several points in this paper on which we desire to comment, and one point in particular which does not co-ordinate with our studies. This point is introduced in the first and second paragraphs on page 140 with the statement that "this article will . . . point out . . . why only fuse link time-current curves made at high voltages are of value in making co-ordination studies." In support of this statement the last paragraph in the first column on page 142 states that "unless 2,300 volts or above is employed in making the tests for plotting the time-current characteristic curves they will only indicate the heating period, whereas the arcing period may be an appreciable portion of the total clearing time. The variation in the arcing period has no proportionate relationship to the heating period over the complete range of fault currents and thus no one numerical or proportionate value can be given for adding to the heating period to determine the total clearing time." This does not, in our opinion, prove the point, because a value can be appreciable from a test viewpoint and still be insignificant for practical application, and we believe such to be the case here.

We have found that with a properly designed fuse link in a properly designed fuse holder, on circuits of normal voltage and power factor, the arcing time is so small in comparison with the time values shown on the curves that for all practical purposes it can be neglected. In the high overload range, say 1,000 per cent, where the melting time is around 0.3 second value, the arc is extinguished at the first current zero, or in a fraction of a half cycle, which is insignificant when added to a melting time of 18 cycles. In the low overload range, where the melting time is around ten seconds, the arcing time may be as long as 8 or 10 cycles, but here again it is of insignificant value when added to a melting time of 600 cycles. So while "no one numerical or proportionate value can be given for adding to the heating period to determine the total clearing time" the variable value of arcing time is so small in comparison with the melting time that for all practical purposes it can be neglected.

We have compared the total clearing time as shown by oscillograph records of high-voltage tests on our own fuse links with the melting time as shown by our low-voltage curves and find them to be substantially the same. We believe, therefore, that the statement that "curves plotted from tests made at lower voltages are, therefore, valueless for comparing with relay curves to determine the operating relationship where the fuse links are beyond the relay and should not be compared with curves made from tests at higher voltages" is questionable. We believe, to the contrary, that our low-voltage time-current curves are highly accurate and of great value, and that the more expensive procedure of testing on high voltage is not justified by the results. We believe, further, that it would be an imposition on our customers for us

to adopt the more expensive method and expect them to attempt to check our results.

Although the arcing time which is caused by high voltage alone is of insignificant value, other factors may cause the arcing time to be of significant value. The total time necessary for a fuse link to clear a circuit depends upon:

1. The initial temperature of the fuse link.
2. The value of current which is applied and maintained.
3. The shape of the current and voltage waves.
4. The exact point on the current wave at which arcing starts.
5. The power factor of the circuit.
6. The oscillating characteristics of the circuit.
7. The design of the fuse holder.
8. The recovery voltage of the circuit.

and upon other factors.

We realize that it is impossible for us to predetermine these variables in service, and they would have to be predetermined and then duplicated in the test set-up in order for total clearing time curves to have any practical value. We know that the initial temperature can be anything from sub-zero to just below the melting point of the weak link; the power factor may be any plus or minus value from 0 to 1; the wave shape may be sinusoidal or very irregular; the recovery voltage may be 2,300 volts or 15,000 volts, etc. If it were possible to control all of these variables for test they would not coincide with any existing field conditions. Therefore, we cannot show definitely what the total time to function in service will be.

We can, however, select arbitrary values for some of these variables and obtain data which is highly accurate and very useful. We believe that the best value of voltage to select for tests is one at which the other variables, which we cannot possibly control in service, will be least effective during the tests. So we have selected 220 volts as the maximum for time-current tests. Time-current curves on this basis give a true and accurate measure of the time to function under these conditions and are valuable for use in co-ordinating fuses and relays, when used with a reasonable factor of safety to allow for other conditions.

On the other hand, time-current curves at 2,300 volts or higher are of questionable value because at these voltages the other factors of wave shape, fuse-holder design, power factor, etc., are introduced into the curves in a significant but unknown degree. Curves drawn from such tests are, therefore, of less value than low-voltage curves, because with low-voltage curves we at least know what is represented and can make reasonable allowance for what is not represented. We would not say that the high-voltage curves are valueless, but they are of questionable value.

On page 143 at the top of the second column is another point upon which we might elaborate. It is stated that "requirements on long lines, such as rural systems, demand small fuse links which will function successfully from currents slightly above the normal rating, up to the interrupting capacity of the fuse cutouts, so as to prevent misapplication regardless of the point of installation. Such fuse links are available." To this might be added that other fuse links are available which not only function successfully from currents slightly above the normal rating, but will function successfully on currents down to the smallest value which will melt the weak link.

At the top of the second column on page 141 it is stated that "an even greater factor of safety than employed in the table would very likely be necessary if fuse links of different design and operating characteristics are used." The "different design" reference is not exactly clear. If this means characteristics different from those illustrated in Fig. 2, then we must disagree, for the factor of safety depends upon the uniformity of the various curves rather than the general shape of the curves. If the reference means that a greater factor of safety would be necessary if a slow characteristic low ampere fuse is used to protect a fast characteristic higher ampere fuse, then we will agree. This is true regardless of make.

E. BOOTHE,
Test Engineer.

James R. Kearney Corporation,
St. Louis, Mo.

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Keep Transformer Loading to Rating

To the Editor of the ELECTRICAL WORLD:

I was very much interested in reading Mr. Church's article on "Metallic Transformer Paints Cut Capacity in Winter," appearing in the August 5 issue of the ELECTRICAL WORLD.

I think the conclusions reached are quite sound. I do believe, however, that it would be well to keep in mind that during the shade periods the ambient temperatures are invariably lower than during the direct sunshine periods and therefore that the actual allowable loading on the transformer should always be equal to the nameplate rating. My experience indicates that the oil temperature will run from 5 to 10 deg. C. cooler at night and during cloudy days than during the sunshine periods. This ought to make up for the increase in temperature due to the metallic paint on large tanks where the heat is not all dissipated from plain surfaces.

V. M. MONTSINGER,
Power Transformer Department.

General Electric Company,
Schenectady, N. Y.

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The Codes and Lighting

To the Editor of the ELECTRICAL WORLD:

Your efforts to bring about better lighting are very timely. In this connection, would it not be well to consider the increased number of lighting hours that must soon be provided with industrial lighting now that shorter working shifts are unavoidable?

This may not seem a practical factor when practically all our present low production is easily cared for in one shift, but most of us are confident that normal production, and more, will soon be back, and when it does come (if history is a safe guide) the present short working day will not be lengthened, but, rather, two and three shifts will be used.

Many an industrial manager now excuses himself in being satisfied with what he knows is not best lighting equipment on the basis that the man-hours used under artificial light are few compared with the man-hours used in daylight. When a far greater portion of output is produced by artificial light this excuse will no longer be valid, and consequently ideal lighting will be far more essential than ever before.

WALTER S. MOODY.

Pittsfield, Mass.

Men of the Industry

Colonel Kelly Heads Buffalo, Niagara & Eastern

At a meeting of the board of directors of the Buffalo, Niagara & Eastern Power Corporation held last week Col. William Kelly, vice-president and general manager, was elected president to succeed Alfred H. Schoellkopf, who will move his business headquarters from

Buffalo to the New York office of the Niagara Hudson Power Corporation, of which he is executive vice-president. Alex D. Robb was elected as Colonel Kelly's successor to the office of vice-president and general manager.

Colonel Kelly has been connected with the Buffalo, Niagara & Eastern Power Corporation since 1926, when he joined the staff of that utility following 31 years spent in the United States Army. Five years prior to his connection with the electrical industry, Colonel Kelly was chief engineer of the Federal Power Commission and was associated with some of the greatest water-power problems of the country. Following his graduation from the United States Military Academy at West Point in 1899, Colonel Kelly spent six years on seacoast fortification construction in San Francisco, Long Island and the Philippine Islands. While in the Philippines he had charge of construction of an electric power plant and of the electric railway on Corregidor Island. He served four years as Assistant Engineer Commissioner in the District of Columbia in charge of water, sewer and building departments. For four years more he was in charge of the rivers and harbors desk in the office of the Chief of Engineers. He was also a member of the International Board of Engineers on the St. Lawrence project.

Mr. Robb has served as vice-president of the Niagara Falls Power Company and is president of the Canadian Niagara Power Company, Ltd., and the Niagara Junction Railway Company, which companies are controlled by Buffalo, Niagara & Eastern Power Corporation. In addition to the vice-presidency and general managership of Buffalo, Niagara & Eastern Power Corporation, Mr. Robb will continue in responsible charge of the Niagara Falls Power Company and its subsidiary properties. He is at present serving as president of the Canadian Electrical Association.

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D. E. Karn General Manager of Consumers Power

D. E. Karn, formerly assistant general manager of the Consumers Power Company, Jackson, Mich., has been named vice-president and general manager of that company to succeed the late Charles W. Tippy. A graduate of Purdue University, Mr. Karn became superintendent of the steam heating department at Grand Rapids for the Consumers Power Company in 1916 and, later, moving to Jackson to work in the rate department of the Hodenpyl-Hardy organization, he was subsequently appointed assistant to the general manager of Consumers Power. After spending more than two years with the Commonwealth Power Corporation, in charge of the securities department, he

was made district manager at Kalamazoo for the Consumers Power Company, but was soon recalled to headquarters at Jackson to become assistant general manager. Mr. Karn has taken an active interest in the Michigan utility associations, being a past-president of the Michigan Electric Light Association.

H. J. Bauer New President of California Edison

Harry J. Bauer, chairman and executive head of the Southern California Edison Company, Ltd., since the fall of 1932, was elected president of that company at a special meeting of the board of directors held September 15, thus adding to his duties as chairman those formerly

attaching to the office of president. The duties of chairman of the board and president were combined under the one title of president. Mr. Bauer has been a member of the Edison company board of directors since 1926, and his association with the company dates back to 1908, when he was employed in the company's legal department. He became general counsel in 1918, resigning from that office in 1919 to enter the private practice of law.

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OBITUARY

JOHN G. BULLOCK, a member of the board of directors of the Metropolitan Water District of Southern California, died suddenly, September 15, at his home in that city. Mr. Bullock was one of the dominant figures in the development of southern California.

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NIELS L. MORTENSEN, works manager of Cutler-Hammer, Inc., Milwaukee, died last week after a brief illness. Mr. Mortensen had been connected with the Cutler-Hammer organization since 1907, serving successively as designer, engineer, supervising engineer, sales engineer, assistant chief engineer and chief engineer. In the course of his career he contributed numerous articles to the technical press and delivered various papers before electrical societies. He was a fellow of the American Institute of Electrical Engineers and a member of the Association of Iron and Steel Electrical Engineers. Mr. Mortensen was born in Denmark and received his technical education in Germany.